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THESIS

Oil Stocks As Trust Investments

by

Kenneth Eaton Davis
(B.S. Northeastern University 1936)

submitted in partial fulfillment of
the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

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I. Introduction

A. Problem Defined

Over a period of years trust funds have been invested in the oil industry and at the present writing many trust portfolios contain one or more oil stocks. Such commitments have been made partly because of confidence in the soundness of the petroleum industry as well as for diversification purposes. In fact, such a large proportion of trust funds is invested in the oil industry that an appraisal of the present economic status of that industry is necessary. This becomes especially apparent when one realizes the concern felt over the fact that domestic crude oil reserves as of the 1946 year end are sufficient to last only an average of 12.2 years. (1) Much has been and is being voiced currently by oil industry experts and investment analysts concerning the rate of future oil discoveries and there is little agreement or unanimity of opinion among them.

Again, the nature of future petroleum and energy requirements has a definite influence upon the future of the petroleum industry. The effects of the production of gasoline from natural gas and coal upon the oil industry must be considered as well as the evaluation of atomic fission as a future source of energy.

The writer also proposes to examine the larger oil companies to evaluate their qualifications for the investment of trust funds. Special consideration will be given those companies whose equities are

(1) Deegan, C. J., "Proven Reserves Increase Despite Record Output", The Oil and Gas Journal, Vol. 45, No. 38, 1947

I. Introduction

A. Problem Defined

Over a period of years many funds have been invested in the oil industry and as the pioneers writing many lurid petroleum novels one or more oil wells. Such investments have been made partly because of confidence in the soundness of the petroleum industry as well as for diversification purposes. In fact, such a large proportion of funds is invested in the oil industry that an appraisal of the economic status of that industry is necessary. This is very especially apparent when one realizes the unusual fall over the last that domestic crude oil reserves as of the 1952 year end are sufficient to last only an average of 12.2 years. (1) Much has been said in being voiced recently by oil industry experts and investment analysts concerning the role of future oil discoveries and there is little agreement in regards to opinions among them.

Again, the nature of future petroleum and energy requirements has a definite influence upon the future of the petroleum industry. The effects of the production of gasoline from natural gas and coal upon the oil industry must be considered as well as the evaluation of nuclear fission as a future source of energy.

The writer also proposes to analyze the larger oil companies to evaluate their qualifications for the investment of trust funds. Special consideration will be given three companies whose equities are

(1) Dawson, C. A., "Crude Reserve Increase Results Small Output", The Oil and Gas Journal, Vol. 52, No. 30, 1954

already in trust investment portfolios to be sure they warrant such investment confidence. As a possible medium for further trust investment diversification, the writer will also make an analysis of the remaining larger oil companies to determine their trust investment merit.

already in stock instrument particularly to be more long-wearing than im-
portant conditions. In a possible setting the further study investigated
diversification, the writer will also show a analysis of the transition
larger oil companies to determine their trend investment merits.

II. Historical Appraisal of the Petroleum Industry

A. Production

Since the first crude oil discovery in the United States in 1859 by Col. Edwin L. Drake in Titusville, Pennsylvania, about 33.2 billion barrels of oil have been drawn from this country's 421,000 oil wells scattered throughout some twenty-four states. (1) During these eighty-seven years the ratio of United States to world production has fluctuated from a high of 99% in 1860 to a low of 41% in 1901 and up to about 60% in recent years. (2)

With the exception of the depression years in the early "Thirties", United States crude oil production has shown a steady increase. In seven of the past eleven years new all time high production records have been made. The military needs of World War II enormously stimulated crude oil output and in 1945 the total production in the United States amounted to about 1.71 billion barrels. Unexpected 1946 peacetime demand for refined products was responsible for the recording of another all time high in crude oil output, amounting to about 1.75 billion barrels. (3)

The following table shows by the most important states, the initial year of discovery of crude oil, year of peak production and volume of crude output in 1946. Also given is the percent by states of

(1) Deegan, C. J., "Peacetime Production Exceeds That at Peak of War", The Oil and Gas Journal, Vol. 45, No. 38, 1947
(2) The Petroleum Almanac, P. 293-200, 1946; Deegan, C. J. and Burns, W. W., "World Oil Operations", The Oil and Gas Journal, Vol. 45, No. 34, 1946.
(3) Deegan, C. J., "Peacetime Production Exceeds That At Peak of War", The Oil and Gas Journal, Vol. 45, No. 38, 1947

II. Historical development of the Canadian Industry

A. Exploration

Since the first crude oil discovery in the Fort of Oil, in 1860 by Col. Edwin L. Drake in Pennsylvania, approximately 40.4 million barrels of oil have been drawn from this country. 217,000 oil wells established throughout some twenty-five states. (1) During these eighty-seven years the rate of Canadian drilling to crude production has fluctuated from a high of 280 in 1900 to a low of 42 in 1921 and up to about 800 in recent years. (2)

With the exception of the depression years in the early "Thirties", Canadian crude oil production has shown a steady increase. In seven of the last eleven years new oil also -by production records have been made. The cumulative total of 1972 has 11 successively calculated crude oil output and in 1967 the total production in the United States amounted to about 3.71 billion barrels. Consequently this production demand for refined products was responsible for the consumption of another oil time high in crude oil output, amounting to about 1.75 billion barrels. (3)

The following table shows by the most important years, the initial year of discovery of crude oil, year of peak production and volume of crude output in 1968. Also given is the percent by states of

(1) Dodge, G. W., "Innovation Production Upends Ideas of Oil", The Oil and Gas Journal, Vol. 66, No. 30, 1967

(2) The Petroleum Chemo, P. 320-320, 1965; Dodge, G. W. and Dorse, C. W., "Post Oil Operations", The Oil and Gas Journal, Vol. 62, No. 38, 1964.

(3) Dodge, G. W., "Innovation Production Upends Ideas of Oil", The Oil and Gas Journal, Vol. 65, No. 30, 1967

1946 production to total crude oil produced in the United States.

Table I.

Crude Oil Production by States

State	Year of Initial Production	Peak Production Year	Peak Production Amount*	1946 Production Amount*	1946 Production % to U. S. Prod.
Texas	1889	1946	764,593	764,593	43.7%
California	1876	1945	326,482	316,606	18.1
Louisiana	1902	1946	151,608	151,608	8.7
Oklahoma	1891	1937	228,839	137,228	7.9
Kansas	1889	1943	106,178	96,579	5.5
Illinois	1889	1940	147,647	74,613	4.3
Wyoming	1894	1946	38,544	38,544	2.2
New Mexico	1913	1941	39,569	36,704	2.1
Arkansas	1920	1944	29,418	28,099	1.6
Mississippi	1933	1942	28,833	24,248	1.4
Michigan	1900	1939	23,462	17,138	0.7

*Thousands of barrels
Includes Nebraska and Missouri after 1938

Source: The Petroleum Almanac, P. 293-299, 1946; Deegan, C. J., "Peacetime Production Exceeds That at Peak of War", The Oil and Gas Journal, Vol. 45, No. 38, 1947

Texas is by far the greatest producing state, accounting for about 44% of total crude oil production in this country during 1946. It produced about 765 million barrels in 1946, recording a new peak production rate. The discovery of the giant East Texas Field in 1930 definitely gave Texas unrivalled leadership in crude oil output. In 1946 the East Texas Field produced some 120.5 million barrels of crude oil, (1) which accounted for 15.8% of total Texas production and 7% of the United States' total. Although this field has reached higher

(1) Deegan, C. J., "Peacetime Production Exceeds That at Peak of War", The Oil and Gas Journal, Vol. 45, No. 38, 1947.

[illegible] production in order [illegible] in the United States.

TABLE 1.

[illegible] Oil Production in Texas

State	Year of Initial Production	Year Production Exceeded [illegible]	Total Production [illegible]	Total Production [illegible]
Texas	1894	1940	770,000,000	40.0
California	1876	1901	319,000,000	16.6
Louisiana	1902	1938	131,000,000	6.8
Oklahoma	1897	1907	113,000,000	5.9
Kansas	1892	1906	109,000,000	5.6
Illinois	1905	1940	107,000,000	5.6
Wyoming	1884	1922	71,000,000	3.7
New Mexico	1913	1941	64,000,000	3.3
Arkansas	1904	1939	60,000,000	3.1
Michigan	1925	1944	41,000,000	2.1
Mississippi	1939	1947	21,000,000	1.1
Montana	1920	1940	17,000,000	0.9

Source: [illegible]
Including Kansas and Missouri after 1939

Source: The Petroleum Industry, by Ziegler, Ickes, Jenkins, Pi[illegible] "Petroleum Production Towards Peak as Year of Test", The Oil and Gas Journal, Vol. [illegible], No. [illegible], 1947

Texas is by far the greatest petroleum state, accounting for almost one-fourth of total world oil production in 1947 (another source [illegible] production since the million barrels in 1940, producing 2 [illegible] production even. The discovery of the giant East Texas field in 1930 definitely put Texas ascendancy in crude oil output. In 1934 the East Texas field produced more than a million barrels of crude oil. (1) Which accounts for 1/3 of total Texas production and 7% of the United States' total. Although this field is nearing [illegible]

(1) Hassell, Op. Cit., "Petroleum Industry" Ziegler, Ickes, Jenkins, Pi[illegible] "Oil and Gas Journal", Vol. [illegible], No. [illegible], [illegible]

output rates in the past, the output in recent years has been quite steady. In 1946, however, its rate of production decreased about 8%. (1) Between 1935 and 1946, Texas increased its crude oil production by 95%. (2)

California crude production increased steadily since 1876 and in 1945 reached a peak of 326.5 million barrels. Based on its 1946 production rate of about 316.6 million barrels, California ranks as the second largest domestic oil producing state, accounting for about 18.1% of total crude production in the United States. Over the past decade California crude oil production increased 52%.

It will be noted in the above table that crude oil production in Louisiana reached a new peak in 1946, amounting to about 151.6 million barrels or about 8.7% of the nation's total. Oil production in this state has tripled during the past decade and in recent years has shown consistent growth. (3)

Oklahoma's 1946 crude oil production of about 137 million barrels ranks it as the fourth largest producer of crude oil, accounting for about 7.9% of total oil produced in the United States. During the past ten years the trend of crude oil production in Oklahoma has been downward, although in 1945 and 1946 its output increased about 15 million barrels over that produced in 1944. (4)

Oil was located in Kansas in 1889 and its production rate has

(1) Deegan, C. J., "Peacetime Production Exceeds That at Peak of War", The Oil and Gas Journal, Vol. 45, No. 38, 1947
(2) See Table I, Appendix A
(3) See Table I, Appendix A
(4) See Table I, Appendix A

Subject matter for the years, the output is greater than the two years already. In fact, however, the rate of production declined about 50. (1) Between 1940 and 1945, there increased the crude oil production up 200. (2)

California crude production increased steadily since 1940 and in 1947 reached a peak of 300.6 million barrels. Based on the 1947 production rate of about 318.4 million barrels, California ranked as the second largest domestic oil producing state, accounting for about 14.3% of total crude production in the United States. Over the past twenty years California crude oil production increased 100%.

It will be noted in the above table that crude oil production in Louisiana reached a new peak in 1948, amounting to about 181.4 million barrels or about 8.2% of the nation's total. Oil production in this state has declined during the past decade and is presently less than one-half the peak.

Oklahoma's 1948 crude oil production of about 347 million barrels ranks 3d in the domestic largest producer of crude oil, accounting for about 15.6% of total oil produced in the United States. During the past ten years the trend of crude oil production is decreasing for the commission, although in 1951 was still the second largest crude in the United States having that produced in 1948. (3)

Oil was located in Texas in 1930 and the production rank the

(1) Stanley C. Ore, "Petroleum Production Commands Time at Peak in Half", The Oil and Gas Journal, Vol. 48, No. 30, 1947
(2) See Table 1, Appendix A
(3) See Table 1, Appendix A
(4) See Table 1, Appendix A

increased over the years until in 1943 it hit an all time high of about 106.1 million barrels. During the past few years its rate has declined to about 99 million barrels where it has held steady. (1)

It should not be assumed that any of these states could not increase production if necessary. Texas, Louisiana, Oklahoma, California and many other states have conservation commissions which prorate production among the various fields. Texas has been the strictest in this respect and such regulation is a result of the ruinious competition in the East Texas Field in 1931 which dropped oil as low as ten cents per barrel in that area. Thus, the purpose of proration, while its language is that of conservation, is that of price stability. The result of proration has been to conserve oil and gas, stabilize price and improve production methods. Because of this regulation of output per well, it often takes several years for a new well to pay its cost of drilling. As a result, much more capital has to be invested in production facilities today than was required in the "Twenties" when no state restricted production. The stability which has resulted from proration has attracted large amounts of capital from the public and institutional investors. (2) Because of the costly nature of locating possible oil bearing lands, obtaining of leases, restricted production, higher drilling expenses, etc, more capital is invested in crude oil producing facilities during the development period rather than in the other departments such as refining, transportation and marketing. (3) The following table shows

(1) See Table I, Appendix A
(2) Pearl, W. A., "Oil Stocks", Pamphlet published by White, Weld & Co., New York City, 1946
(3) Ibid, Page 9

the dollar and percentage breakdown by departments of net invested assets of thirty oil companies as of December 31, 1945.

Table II

Breakdown of Net Invested Assets, Thirty Oil Companies, December 31, 1945

	United States		Foreign		United States and Foreign	
Department	Thousands	Percent	Thousands	Percent	Thousands	Percent
Production	$2,565,677	51.9%	$309,932	67.0%	$2,875,609	53.2%
Transportation	671,316	13.6	36,031	7.8	707,347	13.1
Refining	816,686	16.6	62,674	13.6	881,360	16.3
Marketing	788,427	16.0	52,882	11.4	841,309	15.6
Others	96,336	1.9	1,010	0.2	97,345	1.8
Total	$4,940,441	100.0%	$462,529	100.0%	$5,402,970	100.0%

Source: Joseph E. Pogue, Vice Pres. and Frederick G. Coqueron, "Financial and Operating Data of Thirty Oil Companies", year 1945, P. 14, (Pamphlet) The Chase National Bank of the City of New York, New York City.

Future rates of crude oil production in this country depend on a number of variables such as rate of new discoveries, state proration, price of crude oil, improvement of methods of locating oil, taxation, etc. Under favorable conditions it would seem that for the next five to ten years, oil production in this country should be sufficient to meet probable demand. But if the petroleum industry should encounter difficulty in the discovery of sufficient new crude reserves to maintain present production rates, and demand should exceed expectation, than a production deficiency of a million barrels of crude oil a day might exist in about fifteen years. (1)

Three areas outside the United States account for 80% of total

(1) Wilson, R. F., "Supply and Demand Outlook", Petroleum Requirements-Postwar, 1946, Published by United States Government Printing Office

the dollar are presently unknown. Statements of the investment markets will follow all economies as of January 31, 1968.

TABLE 1

Investments of the Canadian Insurance Industry at December 31, 1967

Asset Class	Ordinary Assets	Percent	Industrial Assets	Percent	Total Assets	Percent
Government	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Municipal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bonds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mortgages	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Shares	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: Adapted in [illegible] from Table, and tabulated in [illegible], Canadian, "Financial [illegible] Investment Mode of Life Companies", June 30, 1967, [illegible] The Chase Manhattan Bank of the City of New York, New York.

Under rules of trade all provisions in this section depend on a number of variables such as rate of new discovery, which provokes, rules of trade etc., improvement of methods of locating oil, insertion, etc. Under favorable conditions it would seem that the small firm in the industry, all production in this activity should be profitable to some profitable amount. But in the production category should remember (1967-1968) in the discovery of [illegible] one cannot rationale to maintain profit profitability rates, and thereby should assume supervisions, also a profiting division of a million barrels of crude oil a day might [illegible] the [illegible] process. (2)

Firms also consider the initial finance because that 60% of total

(2) Williams, C. [illegible], "Supply and Demand Analysis", Petroleum Industry, [illegible] 1967, published by United States Government Printing Office

foreign production. In the following table it will be seen that Venezuela, the Middle East, and Russia produce 37%, 26% and an estimated 17% respectively.

Table III

Estimated Annual Foreign Crude Oil Production*

Country	Annual Rate**	Percent to total
Canada	7,665	0.7%
Mexico	47,085	4.4
Cuba	365	0.1
Total North America (outside U.S.A.)	55,115	5.2
Colombia	21,900	2.1
Trinidad	20,075	1.8
Venezuela and N.W.I.	401,500	37.6
Total Caribbean	443,475	41.5
Argentina	22,630	2.1
Peru	11,680	1.1
Other Latin American Countries	2,920	0.3
Total Other South American Countries	37,230	3.5
Total Western Hemisphere (excluding U.S.A.)	535,820	50.2
Austria	7,300	0.7
Germany (excluding Soviet Zone)	4,745	0.4
Hungary	5,475	0.5
Romania	31,025	2.9
Other European Countries (excluding U.S.S.R. and Baltic States)	3,285	0.3
Total Europe (excluding U.S.S.R. and Baltic States)	51,830	4.8
Egypt	9,490	0.9
Iraq	35,040	3.3
Iran	154,030	14.4
Bahrein-Arabia	71,540	6.7
Kuwait	10,950	1.0
Qatar	***	0.0
Total Near and Middle East	281,050	26.3
China	365	0
Burma	730	0.1
India	2,555	0.2
Japan	1,460	0.1
Other East and South Asia	365	0

Tuesday evening, in the Victoria Lodge Hall, it will be seen that Tuesday is, the Hall being used, the income greater by [illegible] and the expenditure [illegible] respectively.

TABLE III

Income and Expenditure Account - [illegible]

Income	Amount	Percentage of Total
Income		
Donations	[illegible]	[illegible]
Dues	[illegible]	[illegible]
Other	[illegible]	[illegible]
Total Cash Income Receipts (a+b+c)	[illegible]	[illegible]
Catalogue	[illegible]	[illegible]
Advertising	[illegible]	[illegible]
Equipment and Rights	[illegible]	[illegible]
Total Operations	[illegible]	[illegible]
Entertainment	[illegible]	[illegible]
Rent	[illegible]	[illegible]
Other Lodge Lessons Receipts	[illegible]	[illegible]
Total Other Lodge Operations Receipts	[illegible]	[illegible]
Total Income Receipts (Operating Income)	[illegible]	[illegible]
Expenditure		
Postage	[illegible]	[illegible]
Printing (Including Special Issue)	[illegible]	[illegible]
Equipment	[illegible]	[illegible]
Insurance	[illegible]	[illegible]
Other Expenses Functions (Including Officers, and Public Meeting)		
Total Expenses	[illegible]	[illegible]
Total Income Less Expenses, Net Total: [illegible]		[illegible]
Gift	[illegible]	[illegible]
Loan	[illegible]	[illegible]
Gen	[illegible]	[illegible]
Subscriptions	[illegible]	[illegible]
Equipment	[illegible]	[illegible]
Other	[illegible]	[illegible]
Total Some Net Income Year	[illegible]	[illegible]
Other	[illegible]	0
Bonus	[illegible]	[illegible]
Debts	[illegible]	[illegible]
Other	[illegible]	[illegible]
Some Year Net Income Year	[illegible]	[illegible]

Table III Cont'd

Estimated Annual Foreign Crude Oil Production*

Country	Annual Rate**	Percent to total
Total East and South Asia	5,475	0.5%
M.E.I.-Borneo-New Guinea	12,775	1.2
Total Eastern Hemisphere	351,130	32.8
Total Foreign (excluding U.S.S.R. and Baltic States).	886,950	82.9
U.S.S.R. (unofficial estimate)	182,500	17.1
Total World (outside U.S.A.)	1,069,450	100.0%

*Based on November 1946 production rates.
**Thousands of barrels
***Wells shut in.

Source: Deegan, C. J. and Burns, A.M., "World Oil Operations", The Oil and Gas Journal, Vol. 45, No. 34, 1946

Excluding the production of the United States, total Eastern Hemisphere production amounts to about 50% of all foreign crude oil output.

Starting in 1917, Venezuelan output has increased steadily, far outdistancing the rest of the South American countries. Venezuela's 1945 production of 321.9 million barrels showed an increase of 25% over 1944. Its current rate of about 401.5 million barrels annually makes Venezuela the second largest producer of crude in the world. Most of Venezuelan oil development has been the result of efforts of American and British oil companies. In 1944, United States oil companies produced about 75% of total crude output of Venezuela. (1) The petroleum industry has become so important in the Venezuelan economy that about 36% of

(1) "Oil Industry Survey-Outlook During Transition Period and Beyond", Eastman, Dillon & Co., New York City.

Table III [illegible]

Estimated Annual Foreign Exchange Cost of Petroleum Imports

Country	Annual Quota	Percent of Total
Israel (Haifa and Ashdod refs)	[illegible]	[illegible]
Anglo-Persian Company	[illegible]	[illegible]
Total Israeli Imports Transferred	[illegible]	[illegible]
Total Foreign Exchange Expenditure (Crude and Refined Products)	[illegible]	[illegible]
Quantity Imported (Refined Products)	[illegible]	[illegible]
Total Total Imports Refined	[illegible]	[illegible]

Based on December 1964 production rates.
Adjustments of material
Petrolite also Inc.

Source: Compiled by [illegible] and Company, "Israel Oil Industries", The Oil and Gas Journal, Vol. 62, No. 30, July [illegible]

Relating the production of the Israel refinery, Royal Dutch Shell investigations geologists assumed no minor oil or oil foreign-source oil compa-nies.

Starting in 1965, Israelis sought for increasing crude oil. The establishment the year of the Israel Petroleum Corporation. Throughout's 1965 investment of $[illegible] million foreign planned an increase of [illegible] over 1966. The Israeli rate of about $[illegible] million foreign exchange. Transfer the Israel Petroleum Corporation of Israel to the region. Most of Petroleum oil Israelis has been the result of attempts of discover and testing oil companies. In 1965, United States Oil Company in partnership with TPC of United Arab Oil of Tunisia. (1) The petroleum Corpo-ny has become of importance in the Israeli economy because that about 80% of

(1) "Oil Industry Surveys-Israel, Source Investment Trends and Issues", Business Action & Co., New York (1965).

its revenue is derived from taxes levied on oil companies doing business in that country. (1)

The Maracaibo Basin region, reasonably close to water transportation was the first area to be developed in Venezuela. In 1946 its production rate was slightly more than that of the Middle East. Creole Petroleum Co., the major oil producer in Venezuela has drilled over twelve hundred wells in the Lake itself. Eleven hundred of these wells are productive and account for 156.9 million barrels annually. (2) In spite of the amount of development and exploration already accomplished, this basin still has great oil potentialities. (3) Its most prolific field is Lagunillas, which was discovered in 1926. This field alone accounts for about 30% of Venezuelan production. (4)

Even though the Maracaibo Basin is the largest producing area of crude oil outside the United States, current drilling activity is twice as great in Eastern Venezuela. (5) At present this section accounts for only one-third of that country's production. The richness of the fields discovered and estimates of proven reserves made on the most conservative basis, indicate a higher and higher rate of crude oil production in Venezuela which can be sustained for years to come. (6)

The Middle East, the third largest producing area in the world, today ranks as the world's greatest potential oil producing region. The

(1) Government and Municipal Manual, 1947, Moody's Investor's Service
(2) Reed, P., "Deep Water Drilling on Lake Maracaibo", The Oil and Gas Journal, P. 157, Vol. 45, No. 37, 1947
(3) Deegan, C. J. and Burns, W. W., "World Oil Operations", The Oil and Gas Journal, Vol. 45, No. 34, 1946
(4) Ibid, P. 157
(5) Ibid, P. 157
(6) Ibid, P. 157

the revenue to derives from taxes levied on oil companies doing business in that country. (1)

The Maracaibo basin region, reasonably alone in water transportation was the first area to be developed in Venezuela. In 1922 the production rate was slightly more than that of the Middle East. Creole Petroleum Co., the major oil producer in Venezuela has drilled over twelve hundred wells in the last year. Eleven hundred of these wells are productive and account for 122.5 million barrels annually. (2) In spite of the amount of development and exploration already accomplished, this basin still has great oil potentialities. (3) The most prolific field is Lagunillas, which was discovered in 1926. This field alone accounts for about 50% of Venezuelan production. (4)

Long though the Maracaibo Basin is the largest producing area of crude oil outside the United States, current drilling activity is below its great in eastern Venezuela. (5) It presents this section accounts for only one-third of that country's production. The richness of the fields discovered and estimates of proven reserves made on the most conservative basis, indicate a higher and higher rate of crude oil production in Venezuela which can be maintained for years to come. (6)

The Middle East, the third largest producing area in the world, ranks as the world's greatest potential oil producing region. The

(1) Overseas and Montgomery Manual, 1927, Moody's Investor's Service
(2) Dana, F., "Deep Water Drilling on Lake Maracaibo", The Oil and Gas Journal, P. 127, Vol. 42, No. 37, 1937
(3) Lawson, C. J. and Burns, R. E., "World Oil Operations", The Oil and Gas Journal, Vol. 42, No. 34, 1940
(4) Ibid, P. 127
(5) Ibid, P. 127
(6) Ibid, P. 127

area contains enormous fields from which millions of barrels of oil can be and are being produced from a very few wells. This is the richest petroliferous area ever found, and the surface has hardly been scratched as far as exploration is concerned. (1) In November 1946 this region was producing at the rate of 284.3 million barrels of crude oil annually as compared to about 401.5 million barrels annually for Venezuela.

Iran with a current annual rate of 154.0 million barrels accounts for about 60% of all petroleum currently originating in the Middle East. This country has six oil fields containing about 66 wells and the average daily output for the active wells is about 6600 barrels per well. Present exploratory and development efforts are hampered by unstable political conditions and lack of skilled labor. The Standard Oil Company (New Jersey) and Socony Vacuum Oil Company, Inc. have been negotiating to buy a substantial amount of Iran's output.

Production in Saudi-Arabia increased from 27.4 million barrels annually in 1945 to a rate of 73.0 million barrels at the end of 1946. This increase was due to the opening of two new fields. (2) A big impetus to rapid expansion of petroleum activities in Saudi-Arabia may be given by the proposed purchase from Texas Company and Standard Oil Company of California by Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company, Inc. of substantial interests in Arabian American Oil Company, operator of the Saudi Arabian properties. (3)

Iraq, with current production rate of about 35.0 million bar-

(1) Ibid, P. 157
(2) Ibid, P. 157
(3) Ibid, P. 157

rels annually from two fields having eleven wells ranks as the third largest producer in the Middle East. (1) Here the average is about 8,720 barrels daily per well. Since the average proved daily sustained productiveness of these wells is between 32,000 and 36,400 barrels, it is apparent that from these wells alone production could be increased fourfold if needed. (2)

The tiny State of Kuwait with one field containing only five wells currently produces about 11.0 million barrels annually. (3) This represents entirely new production as several wells started just prior to the outbreak of World War II were not completed until after the termination of hostilities. Negotiations are under way whereby Jersey Standard and Socony-Vacuum will be buying crude from the Kuwait field and it is expected that production will be substantially increased in 1947. (4)

Egypt is the remaining producing area in the Middle East with current production of 9.5 million barrels annually coming from one hundred wells located in two fields. (5)

Qatar has one field containing two wells which are currently shut in. (6)

There are no official figures available at present on the status of the petroleum industry in Russia. This is probably due to war

(1) "Journal Guide to World Oil", The Oil and Gas Journal, Vol. 45, No. 34, 1946
(2) Ibid, P. 1
(3) Ibid, P. 1
(4) Burns, W.W., "Second Major Middle East Deal Disclosed; Jersey, Socony to Buy Iranian Crude", The Oil and Gas Journal, Vol. 45, No. 34, 1947
(5) "Journal Guide to World Oil", The Oil and Gas Journal, Vol. 45, No. 34, 1946
(6) Ibid, P. 1

[illegible] accordingly from the fields operated either wholly or in part by the great producer in the United States. (1) Since the average is about 1,750 barrels daily per well, these the average producer daily contributed approximately [illegible] of these wells in between 1,[illegible] and 10,000 barrels, it is apparent that the [illegible] wells whose production would be discovered there [illegible] (2)

The high degree of density with the field accounting only for [illegible] wells currently producing about 11.0 million barrels annually. (3) This [illegible] accordingly was predominant in developing wells already [illegible] to the exclusion of other. It seems not improbable that [illegible] the [illegible] of activities. Depletions are rather low [illegible] and [illegible] will be varying across the overall field and it is expected that production will be substantially increased in 1941. (4)

Lower in the producing producing area in the United that with [illegible] production of 3.6 million barrels annually which was [illegible] wells located in San Diego. (5)

Other has the field accordingly the wells which are [illegible] also is. (6)

There are no artificial lights available or present in the area of the petroleum industry in Alaska. This is probably due to [illegible]

(1) "Journal Guide to Worth Oil", The Oil and Gas Journal, Vol. 40, No. [illegible], 1942
(2) Ibid, p. 2
(3) Ibid, p. 3
(4) Burns, T.E., "General Major Wells Each Best Theoretical Survey, Economy in Top Production Trade", The Oil and Gas Journal, Vol. 40, No. 44, 1942
(5) "Journal Guide to Worth Oil", The Oil and Gas Journal, Vol. 41, No. 44, 1942
(6) Ibid, p. 3

damage to petroleum facilities as well as reluctance to release such data. Under normal conditions Russia's crude output should be around 219.0 million barrels annually from prewar proven productive areas. An unofficial estimate of Russia's present rate is 182.5 million barrels annually. However, it is interesting to note that as piecemeal information covering war damage does become available, the estimate of current production rate is revised downward. More than in any other country, the future production rate of Russian oil fields is very definitely tied in its government's overall plans and the part oil is to play in them. (1)

Romania, Austria, Hungary and Germany currently supply 48.5 million out of 51.8 million barrels of crude produced annually in Europe (excluding Russia). The present annual production rate of 51.8 million barrels compares with a prewar normal of 55.8 million barrels. Romania was producing at the rate of 31.0 million barrels annually at the year end, while the annual rates for Austria, Hungary and Germany were 7.3 million, 5.5 million and 4.7 million respectively. Everywhere in Europe, expansion of crude production facilities is being impeded by a shortage of drilling and development equipment. (2)

The annual production rate of Mexico in November 1946 of about 47.1 million barrels was about 4.4% of the total foreign production. Crude oil output hit its peak in Mexico in 1921, but by 1945 had de-

(1) Deegan, C. J. and Burns, W. A., "World Oil Operations", The Oil and Gas Journal, Vol. 45, No. 34, 1946
(2) "Journal Guide to World Oil", The Oil and Gas Journal, Vol. 45, No. 34, 1946

[illegible] in petroleum facilities as well as refineries to release crude data. Other lateral modifications should't cause delays should be around $[illegible]$ million barrels annually from planned refinery capacity. In qualitative estimate of Canadian production drop in 1974-5 million barrels annually. Therefore, it is interesting to note that in Canadian integrated oil companies and Canada have lesser availability, the estimate of regional production gain is revised downward. Some step, by any other measure, the future production gain at Canadian oil fields is very beneficial and is in the government's overall plans and can just as well be play in demand. (1)

Canada, Alberta, Imperial and Gulf-Gay overseeing supply plus million and of 2.4 million barrels of crude production annually in (Canada (excluding Alberta). The present annual production rate of 0.4 million barrels currently with a power annual of 0.4 million barrels. Canada was producing at the rate of 2.4 million barrels annually at the year end, while the annual rate for Alberta, Imperial and Gulf were 1.8 million, 0.2 million and 0.7 million respectively. Energy-short in Europe, expansion of crude production facilities is being hampered by a shortage of drilling and development equipment. (2)

The annual production rate of Canada in September 1973 of about 4.1 million barrels was about 2.4% of the total foreign production. Crude oil output hit the peak in Canada in 1973, but by 1980 has de-

(1) Dawson, R. A. and Burns, J. C., "Alberta oil expansion", The Oil and Gas Journal, Vol. 71, No. 36, 1973
(2) "Canadian units to build oil", The Oil and Gas Journal, Vol. 71, No. 34, 1973

clined to about 22% of that figure. (1) Since Mexican expropriation of petroleum properties in 1938, little scientific exploration has taken place with the result that there have been no new field discoveries of any consequence since 1931. Most geologists consider Mexico comparatively unexplored so far as oil is concerned. (2)

Next to Mexico ranks Argentina, Columbia, Trinidad and Peru, respectively, accounting for a very small percentage of total South American oil production. Columbia, adjacent to Venezuela, is just beginning to be explored and developed.

Prior to the war the Netherlands East Indies area, composed of Borneo, Java, Sumatra and Ceram produced between 65.7 and 73.0 million barrels annually. Deliberate wartime sabotage by the British and American governments followed by Japanese military sabotage left these fields very badly damaged. (3) In November 1946 the annual production rate for the East Indies was but 12.8 million barrels. Lack of balanced transportation and refinery facilities was partly responsible for this poor showing. The bulk of the production facilities is in areas where the Netherlands Government is encountering difficulty in reestablishing its relationship with the nationals of the islands. Thus restoration of the fields to normal production will be slow and it is estimated that it will take four years for complete rehabilitation.

Production in the Far East during November 1946 was at the

(1) The Petroleum Almanac, P. 295, 1946
(2) Deegan, C. J. and Burns, W. W., "World Oil Operations", The Oil and Gas Journal, Vol. 45, No. 34, 1946
(3) "Journal Guide to World Oil", The Oil and Gas Journal, Vol. 45, No. 34, 1946

dished to about 25% of that figure. (1) Since Russian exploitation of petroleum properties in 1920, little satisfactory information has come plane with the result that there have been no new field discoveries of any consequence since 1921. Most prolific remains Baku, comparatively-ly unexplored as far as oil is concerned. (2)

Next to Baku come Grozny, Maikop, Tyumen and Ferg, respectively, accounting for a very small percentage of total Soviet own oil production. Dalnaya, adjacent to Vladivostok, is just beginning to be explored and developed.

Prior to the war the Netherlands East Indies were, vanguard of Burma, Java, Sumatra and Celebes produced between 85.7 and 7.2 million barrels annually. Deliberate wrecking sabotage by the British and Dutch-men governments followed by Japanese military exploitation left these fields very badly damaged. (3) In November 1945 the annual production from for the past twelve was but 18.5 million barrels. Lack of balanced transportation and refinery facilities was partly responsible for this poor showing. The bulk of the production facilities is in areas where the Netherlands Government is encountering difficulty in re-establishing the rule-of-authority with the nationals of the islands. Time restoration of the fields to normal production will be slow and it is estimated that it will take four years for complete rehabilitation.

Production in the far East during November 1945 was at the

(1) The Petroleum Almanac, P. 326, 1952
(2) Dunlap, O. E. and Lerne, H. R., "World Oil Operations", The Oil and Gas Journal, Vol. 45, No. 36, 1946
(3) "Journal Guide to World Oil", The Oil and Gas Journal, Vol. 44, No. 34, 1946

small rate of 5.5 million barrels annually. India, Japan, Burma and China accounted for 2.6, 1.5, 0.7, and 0.4 million barrels annually respectively. The Burmese wells are currently producing at but ten percent of their prewar rate, due to unsettled political conditions as well as badly war damaged facilities. (1) These 0.7 million barrels annually are being produced by the British Military Occupation forces. (2)

(1) Deegan, C. J. and Burns, W. W., "World Oil Operations", The Oil and Gas Journal, Vol. 45, No. 34, 1946

(2) "Journal Guide to World Oil", The Oil and Gas Journal, Vol. 45, No. 34, 1946

small rate of 5.6 million barrels annually. India, Japan, Korea and Other accounted for 2.4, 1.5, 0.4, and 0.4 million barrels annually respectively. The Chinese media are currently predicting a 5% increase of crude power rate, due to unsettled political conditions as well as badly war damaged facilities. (1) These 4.7 million barrels annually are below produced by the private military companies Taiwan. (2)

(1) Dongxia, C. J. and Liyong, C. S., "World Oil Dynamics", The Oil and Gas Journal, Vol. 45, No. 24, 1988

(2) "Internal Crisis in World Oil", The Oil and Gas Journal, Vol. 45, No. 24, 1990

B. Reserves

Perhaps no phase of the oil industry has caused more concern than has the subject of crude oil reserves. Thousands of opinions and predictions have been voiced as to domestic petroleum reserves and the outlook for the petroleum industry. The first prediction came twenty-three years after Drake's well discovered oil. Then there was estimated to be only 69 million barrels of oil remaining in the United States. (1) At present Texas produces eleven times that amount annually. Again in 1918 the oil industry experts estimated the supply of crude oil in the United States both "proved" to exist and "to be discovered" at only 7 billion barrels and the automobile industry feared its growth would be hindered by an oil shortage. (2) Since that time the domestic petroleum industry has produced 33.2 billion barrels of oil (3) and at the end of 1946 had "proved" reserves of 21.3 billion barrels. (4) Based upon 1946 production rate of about 1.75 billion barrels annually these reserves are sufficient to last an average of 12.2 years. This does not mean that production would cease at the end of that period, but that during this period production will decline and production thereafter will taper off for many decades to come. This is because oil well pressure gradually decreases over a period of years depending upon rate of production and the size of the oil field.

(1) "Fill 'Er Up", Monsanto Magazine, Vol. 26, No. 4, 1946
(2) Faust, Walter L., Vice Pres. Socony-Vacuum Oil Company, Speech reported by New York Times, November 21, 1946
(3) Deegan, C. J., "Peacetime Production Exceeds That at Peak of War", The Oil and Gas Journal, Vol. 45, No. 38, 1947
(4) Deegan, C. J., "Proven Reserves Increase Despite Record Output", The Oil and Gas Journal, Vol. 45, No. 38, 1947

6. Summary

Perhaps we phase of the oil industry has caused more concern than the subject of crude oil reserves. Discussions of opinions and predictions have been valued as to domestic petroleum reserves and the outlook for the petroleum industry. The first prediction were thoughtfully young author Lewis's well discovered oil. Then claims was restricted to be only 80 million barrels of oil remaining in the United States.

(1) As present time produce eleven times that amount annually. Again in 1919 the oil industry supports restricted the supply of crude oil in the United States until "proved" to exist and "to be discovered" is only 7 million barrels and the automobile industry feared the growth would be hindered by an oil shortage. (2) Given that time the domestic petroleum industry has produced 55.2 billion barrels of oil (3) and at the end of 1940 had "proved" reserves of 21.2 billion barrels. (4) Based upon 1940 production rate of about 1.75 million barrels annually these reserves are sufficient to last an average of 12.1 years. This does not mean that production would cease at the end of that period, but that during the next period production will decline and production therefore will taper off for many decades to come. This is because oil well pressure gradually decreases over a period of years depending upon rate of production and the size of the oil field.

(1) "Will the Oil", Business Magazine, vol. 16, no. 4, 1944
(2) Pratt, Walter L., The Fire. Energy-Tension Oil Company, Speech reported by The New York Times, December 27, 1944
(3) Lerman, C. W., "Petroleum Production Decline Cuts Reserves", The Oil and Gas Journal, vol. 43, no. 32, June
(4) Johnson, J. E., "Proven Recovered Petroleum Reserve Decreased", The Oil and Gas Journal, vol. 43, No. 32, 1947

Generally speaking, yearly additions to known reserves have exceeded production rates for quite a number of years. Thus, proved reserves have been increasing to a small extent rather than declining over the past decade. However, during recent years the rate of discovery, although greater than current production, has shown a marked decrease. For example, between 1935 and 1939 new discoveries averaged about 2.4 billion barrels while current production rate was about 1.1. This gave a net average addition to proved reserves of about 1.3 billion barrels annually. Between 1940 and 1945 new discoveries averaged 1.9 billion barrels per year, giving a net average annual addition to reserves of but 0.4 billion barrels. (1) In 1946 there was a net addition of 0.3 billion barrels of crude oil to reserves. (2) Thus, it is evident that if this most recent rate of decline in the ratio of new discoveries to production should continue, annual production would soon have to begin to decline. (3)

The average yearly proved reserves of crude oil in the ground since 1919 has been 13.6 years, so the position of the oil industry in this country is no worse off in respect to reserves than it has been for many years. The financial aspect of oil company operation is one of the main factors why proved crude reserves in this country do not vary much from year to year. Exploration and development work is so costly and an

(1) See Table II, Appendix A
(2) Deegan, C. J., "Proven Reserves Increase Despite Record Output", The Oil and Gas Journal, Vol. 45, No. 38, 1947
(3) Bell, D., Simpson, K., Mikol, V., "Petroleum", United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1946

Generally speaking, yearly additions to known reserves have exceeded production since the quite a number of years. Thus, proved reserves have been increasing to a small extent rather than depleting over the past decade. However, during recent years the rate of increase, although greater than current production, has shown a marked decrease. For example, between 1939 and 1942 the characteristic average annual increase was 4.4 billion barrels while current production rate was about 1.1. This gave a net average addition to proved reserves of about 3.3 billion barrels annually. Between 1940 and 1942 the discoveries averaged 3.8 billion barrels per year, giving a net average annual addition to reserves of but 0.4 billion barrels. (1) In 1946 there was a net addition of six billion barrels of crude oil to reserves. (2) Thus, it is evident that if this rate record rate of decline in the rate of new discoveries or production should continue, annual production would soon have to match to decline. (3)

The average yearly proved reserves of crude oil in the United States 1911 has been 12.5 years, so the position of the oil industry in this country is no worse but is regard to reserves than it has been for many years. The financial aspect of oil industry operations is one of the main factors why proved crude reserves in this country do not vary much from year to year. Exploration and development work is so costly and so

(1) See Table II, Appendix A.
(2) Ewing, O. O., "Proved Reserves Increased Despite Record Output", The Oil and Gas Journal, Vol. 45, No. 34, 1947
(3) Pyl, D., Lipson, E., Wood, W., "Petroleum", United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1948

oil company can afford to develop crude reserves only to a certain degree. Thus, while proved reserves may not appear to be large, oil companies do have thousands of undeveloped acres on which their geologists have located prospective oil lands but which will not be tested and developed until a few years before they are needed. Thus, in considering a company's crude oil reserves, undeveloped acreage is an important factor. (1)

Drilling activity is a key index in determining the rate the oil industry is providing for present and future oil production. The amount of oil produced is based primarily upon the number of productive wells, as well as the rate of production which is in large measure determined by proration policies of the various states. The number of these wells in turn are a result of the rate of drilling activity each year. Some newly drilled wells serve to provide new reserves due to discoveries of new pools while others replace abandoned ones in existing fields. Crude oil prices today appear to influence most the rate of exploratory drilling. As the demand for crude oil increases, due in part to state proration practices, crude oil prices rise. This increases the number of operators willing to drill wildcat wells. As prices rise still further, "wildcatters" get further away from known producing areas or drill deeper wells in existing fields. Thus more discoveries are made and as production gradually increases the price of crude oil drops, causing exploratory drilling to be curtailed. (2)

(1) Pearl, W. A., "Oil Stocks", Pamphlet published by White, Weld & Co., New York City, 1946
(2) "Oil", Standard & Poors Industry Surveys, November 29, 1946

oil industry has failed to develop social relations only in a manner so-
ciety. Thus, while general economic ties will exist in an industry, oil com-
panies do have financial or manpower ties with no other industry. Oil
rate Journal appearance oil issue but also oil will not be looked and de-
velopment small a few years before that are needed. Thus, in considering
a company's social relations, administrative manager is an business the-
ory. (1)

Drilling activity is a key issue in determining the role the
oil industry in providing the growth and future oil production. The
success of oil production is based primarily upon the number of producing
wells, as well as the rate of production which is in turn dependent
tangible in production policies of the various states. The number of
wells drilled is thus key a result of the rate of drilling activity each
year. Some major drilling units serve to provide the resources for
development of the people of the county including economic ties in indus-
ing fields. Since oil prices have very recently so increased and the rate
of accelerating drilling, in the second half which oil increases, the is
part to which production problems, which oil prices rise. This in-
creases the number of economic utility to drill added wells. As
prices rise drill further, "stimulators" oil further and then some
production stops or drill deeper wells in producing fields. This some
discoveries are made and as production probably increases the rate of
drill oil high, warrant exploratory drilling is to continue. (2)

(1) Ibid., p. 1, "Oil Ranges", Publish published by Bolton, and 1 Jan.
Jan 1961, 1962.
(2) "Oil", Colonial & Home Industry Journal, December 24, 1962

It may also be stated that the cost of drilling a well in the United States has increased over the past few years. This rise in costs is due mainly to the necessity for the drilling of deeper wells and a general increase in the costs of equipment and higher scale of wages paid. This cost averaged $69,300 per well in 1945 while in 1944 the average cost was $51,500. (1)

It will be noted in Table II of Appendix A that the bulk of the additions to reserves has come through revisions of previous estimates of reserves or extensions in area of known fields. Conservatism in original estimates plus more efficient methods of extraction by recycling of gas, water injection, and unitization and pressure maintainance of fields have been important contributors. Proration has also eliminated wasteful competition and in effect has increased the amount of oil which may be extracted from the ground per well, thus lengthening the life of many wells.

The following table shows that as of January 1, 1947, about 79% of the United States oil reserves were located in three states:

Table IV.

Estimated Proven Crude Oil Reserves January 1, 1947

State	Thousands of Barrels Estimated Reserves	Gain or Loss During Year	Percent U. S. Total
Texas	11,800,162	+59,511	55.2%
Panhandle	338,357	-50,960	1.6

(1) Pogue, J. E., and Coqueron, F. G., "Financial and Operating Data of Thirty Oil Companies Year 1945", P. 18, Published by The Chase National Bank of the City of New York, 1946

It may also be stated that the cost of drilling a well in the United States has increased over the last few years. This idea is made it due mainly to the necessity for the drilling of deeper wells and a general increase in the costs of equipment and labor which of wages paid. This most averaged $20,000 per well in 1940 while in 1944 the average cost was $23,000. (1)

It will be noted in Table II of Appendix A that the rate of the additions to reserves has gone through periods of previous exploration or reserves or extensions in area of known fields. Conservation in original estimates plus more efficient methods of exploration by the application of gas, water injections, and cleanouts and pressure maintenance some of fields have been important contributors. Production has also affected worldwide competition and in effect has increased the amount of oil which may be extracted from the ground per well, thus lengthening the life of many wells.

The following table shows that as of January 1, 1947, about 72% of the United States oil reserves were located in three states:

Table IV

Estimated Proven Crude Oil Reserves January 1, 1947

	Thousands of Barrels		
State	Estimated Reserves	Net Gain or Loss During Year	Percent U. S. Total
Texas	11,800,108	+80,311	48.2%
Oklahoma	233,287	-68,905	1.0

(1) Hyman, L. E., and Cooper, F. G., "Financial and Operating Data of Thirty Oil Companies Year 1944", p. 12, Published by The Chase National Bank of the City of New York, 1946

Table IV Cont'd

Estimated Proven Crude Oil Reserves January 1, 1947

State	Thousands of Barrels Estimated Reserves	Gain or Loss During Year	Percent U. S. Total
East	3,245,845	+157,801	15.1%
North	424,181	-58,557	2.0
Eastern	3,549,659	+131,170	16.5
Southwest	1,617,418	+558,014	7.6
Gulf Coast	2,624,702	-677,957	12.3
California	3,349,148	-82,406	15.7
Louisiana	1,644,635	+150,765	7.7
Oklahoma	947,274	-56,145	4.4
Kansas*	579,746	-52,166	2.7
Wyoming	611,409	+ 9,382	2.9
New Mexico	507,914	-52,198	2.4
Illinois	373,348	+ 32,272	1.8
Mississippi	472,389	+172,176	2.2
Arkansas	279,997	-8,909	1.3
Colorado	272,509	+ 66,473	1.3
Pennsylvania	137,042	+ 28,666	0.6
Montana	95,189	+ 796	0.5
Michigan	69,036	-4,663	0.3
New York	60,153	-9,675	0.3
Kentucky-Tenn.	46,372	+ 1,450	0.2
West Virginia	35,847	+ 745	0.2
Ohio	23,628	-1,485	0.1
Indiana	34,914	+10,095	0.2
Alabama	3,426	+ 1,430	---
Florida	1,000	+ 1,000	---
Total	21,545,138	+207,114	100.0%

*Includes Nebraska-Missouri

Source: Deegan, C. J., "Proven Reserves Increase Despite Record Output", The Oil and Gas Journal, Vol. 45, No. 38, 1947

Texas's share was about 55.2% with the East Texas, West Texas and Upper Gulf regions containing the bulk of the reserves. California ranks second with 15.7% of domestic reserves while Louisiana holds third place with 7.7%. Other states of lesser importance are Oklahoma, Kansas and Wyoming. During 1946, Mississippi, Louisiana and Colorado

made greatest net additions to total domestic proved reserves by adding 172 million, 151 million and 66 million barrels respectively. States showing the largest losses were California, Oklahoma and Kansas with declines of 82, 56 and 52 million barrels respectively. Texas showed a net gain in reserves of but only 60 million barrels but substantial changes took place in its main producing areas. The Gulf Coast region lost 678 million barrels which was offset by gains of 358 million barrels in the Southwest area, 131 million barrels in the Eastern region and 158 million barrels in the West Texas region. Losses of 59 million and 51 million barrels were registered by the North Texas and Panhandle regions.

It may be said that of all the countries in the world the United States has been most scientifically and thoroughly explored for crude oil potentials. In recent years much attention has been focused upon oil potentialities on the continental shelves and slopes of the coastlines of this country. It is now believed that there are two and one half times as much oil to be discovered on the continental slopes and shelves of the world as there is under dry land areas. (1) Several oil companies already have producing oil wells in the Gulf as well as along the coast of California. It is believed that the shelves and slopes of the whole Caribbean area have enormous crude oil potentials.

It is estimated that besides the present estimated reserves

(1) Pratt, W. E., retired Vice Pres. Standard Oil Company (New Jersey), Speech before Tulsa, Oklahoma Geological Society, December 1, 1946, Published in The Oil and Gas Journal, Vol. 45, No. 31, 1946

made (Venezuela) had additions to known reserves proved primarily by adding 372 million, 321 million and 64 million barrels respectively. Taken together the largest lower 48 discoveries, Alaskan and Canada additions of 121, 80 and 68 million barrels respectively. These giants a mere pick up in reserves of less than 20 million barrels. Some giants a dozen years ago in reserves of less than 20 million barrels are substantially changing that place in the new producing areas. The Gulf Coast region had 278 million barrels which was offset by sales of 181 million barrels in the producing area. 171 million barrels in the Southern region and 140 million barrels in the West Texas region. Losses of 21 million and 13 million barrels were experienced by the North Texas and Oklahoma regions.

It may be well kept of all the discoveries in the world the Gulf Coast Region has been most productive and economically rewarded for crude oil primarily. In recent years much attention has been focused upon oil potentialities in the environmental sensitive but places of the continents of this country. It is now believed that there are not yet built fixed on such oil to be discovered on the environmental sensitive and sculpture of the world as there is under the Gulf Coast area. (1) Several oil and companies already have pursuing oil wells in the Gulf as well as other the coast of California. It is believed that the sculpture and slopes of the Gulf Coast Region area have numerous crude oil potentials.

It is noticeable that besides the proved reclaimed reserves

(1) Stone, R. G., Proved Time Pro. Standard Oil Company (New Jersey), Lecture before Tulsa Geologic Geological Society, December 1, 1962, Published in The Oil and Gas Journal, Vol. 60, No. 21, 1962

of 21.3 billion barrels there still remain about 80 billion barrels of crude oil to be discovered in the United States. (1)

It should be remembered that proved reserves are only estimates made by oil experts after a field has been developed by the drilling of a number of wells, and as such are somewhat inaccurate. Reserves of foreign countries are quite apt to be even more inaccurate because they have been made under varying conditions and from different points of view by men with varying degrees of talent. Table III of Appendix A gives a breakdown of estimated world crude reserves by continents and countries. As a nation, the United States at present has about one-third of total world proved petroleum resources and has twice as many proved reserves as any other single nation. The Middle East has crude oil reserves of 26.8 billion barrels, and were found as a result of little exploration and at the expense of drilling only one hundred fifty wildcat wells. Thirty times this number of wildcats were drilled in the United States during 1946. Thus, while the present proved and indicated reserves of the Middle East are slightly more than the United States, ultimate discoveries of oil will aggregate many more billions in the Middle East when more intensive development and exploration work is carried out in future years. In fact, the so-called center of gravity of world petroleum production is shifting from the Gulf-Caribbean area to the Middle East, where it is expected to gradually become

(1) Zook, R. T., former President of Independent Petroleum Association of America, Speech before 1946 Annual Meeting of American Petroleum Institute, Chicago, Illinois, November 15, 1946. Printed in Boston News Bureau, November 16, 1946

of 31.2 million bushels. Above still remains some 20 million bushels of wheat, which is to be disposed of on the United Fronts. (1)

It should be remembered that proved reserves are only indicated by well supported estimates a field has been successful in the drilling of a number of wells, and is not any guarantee. The discovery of foreign conditions for oil is not to be over-emphasized as many fields have been found containing considerable oil yet unsatisfactory from the point of view of good with economic factors. Cases can be quoted of a place a producer or wildcatter would drill single handed on a shoestring and succeeded. In a country, the United States or Canada and Australia of which means proved petroleum resources and has taken an early growth treatment as only under adequate control. The fields that have shown well measures of this British Empire, and more there is a field of fields exploration and of this expense of drilling only one hundred thousand wells. Shortly before this number of wildcats were drilled in the United States during 1922. Then, with the proved proved and national resources of the fields that are slightly more than the United States, estimate discoveries of oil will supply the British Empire for the fields that are more favorable development and exploration may be carried out in future years. In fact, the so-called number of quality of world petroleum production is adding time the satisfactory time area in the fields, where it is supposed to gradually decrease

(1) Jones, G. Ia, Foreign Petroleum or Independent Petroleum Association of America, Annual Report Joint Annual Meeting of Petroleum Principles Institute, Chicago, Illinois, November 15, 1922. Printed in Petroleum Age Journal, December 24, 1922

firmly entrenched. (1)

It is believed that given sufficient time and a reasonable amount of equipment, any one of four groups of oil companies operating (2) in the Middle East could develop and sustain enough production from its own properties to supply world needs for oil for many years into the future. (3) It seems likely that other large oil producing countries of the world will add more percentagewise to present proved reserves than will the United States. The main reason for this is that most of the other producing countries of the world have not been prospected as intensely as has the United States. For years the United States has furnished about 60% of total world output and has consumed about the same percentage of crude oil also. To sustain a large volume of production a vigorous search for oil has been made in most of the promising areas of this country with the result that it is becoming increasingly difficult for oil companies to discover new oil fields.

(1) DeGolyer, E., "Preliminary Report of the Technical Oil Mission to the Middle East", February 1, 1944, Petroleum Reserves Corporation, Washington, D. C.
(2) See Appendix B.
(3) DeGolyer, E., "Preliminary Report of the Technical Oil Mission to the Middle East", February 1, 1944, Petroleum Reserves Corporation, Washington, D. C.

C. Consumption

At first petroleum's use was primarily in the form of kerosene for heating, cooking and illuminating purposes, competing with coal-oil in replacing the increasingly scarce supply of whale oil. Gasoline was an undesirable by-product as its presence in kerosene caused the lamps and stoves to explode. Gasoline was a glut on the market and was first sold as a cleaning fluid but most of it was thrown away.

With the rapid growth in the use of machinery, lubricating oil, a by-product of kerosene, found an economic use. The oil industry received a large stimulus around 1900 when industrialists saw the possibilities of petroleum in relation to new engineering developments.

The increasing importance of the then infant automobile industry made such a demand for gasoline as a fuel that during the first decade of the twentieth century gasoline became more important than kerosene as a refined product. (1) This change in demand created the problem of increasing the proportionate amount of gasoline derived from each barrel of crude oil. The basic solution was accomplished in 1913 by use of the "cracking" process (Burton Process), whereby crude oil was broken down into its refined products by means of high temperatures and pressures.

Since this original improvement, many modifications in refining techniques have increased the percentage recovery of gasoline from crude petroleum. This ratio has risen from 10% in 1880 to about 45% in 1935. In the first ten months of 1946 this ratio was about 39%. Subsequent im-

(1) The Petroleum Almanac, P. 4, 1946

C. Conclusion

At first particularly was one primarily in the form of between the heating, melting and filtrating processes, requiring each machine to withstand the immense heat applied at whole oil. Decision was no understandable difficulties as the pressures in extreme moment non-longer had always to develop. Distillation was a risk on the machine and was first said to be already first had need of it was therefore early.

With the right growth in the use of machinery, introducing oil, a department of interest, fixed as economic use. The oil industry experienced a large activities around 1900 when industrialists saw the possibility of profiters in relation to new accompanying developments.

The important importance of the time defined advantage industry may well be chosen for providing in a final list during the first decade of the twentieth century despite these were important than anyone as a critical problem. (1) Life change in demand revealed the problem of increasing the productiveness amount of possible derives from each barrel of crude oil. The basic solution was accomplished in 1913 by use of the "cracking" process (Burton Process), whereby crude oil was heated down into the refined products by means of high temperatures and pressures.

Some like original improvements, many modifications in refining techniques have increased the percentage recovery of gasoline from crude petroleum. The price was cheap from 10¢ in 1900 to about 12¢ in 1920. In the first few months of 1920 this price rose was about 30¢. Subsequent the

(1) The Petroleum Chemist, C. A. Jobe

provements in refining methods, called hydrogenation and the calalytic process have made possible a further increase in the possible yield of gasoline from crude oil. Also a larger amount of high octane gasoline has been achieved through technological refining developments. Desulphurization, a process for separating sulphur from crude oil, made available for war purposes large amounts of high-sulphur content crude oils from West Texas and New Mexico. Super-fractionation is a process which originated in the growing natural gasoline industry which derives gasoline from natural gas. Its purpose is to separate the lighter hydrocarbons from the heavier. (1)

In recent years, by-products have increased very rapidly and the petroleum industry is now regarded as the chemical industry of the future. (2) Its present by-products include chemicals for synthetic rubber, paint, "soapless" detergents, etc. It is likely that this branch of the petroleum industry will become increasingly important in the future. Most of the major oil companies are expanding their research departments to continue wartime research gains made in this field. (3) Already one oil company has announced plans to market a soapless detergent in the near future. It is considered possible that in the next few years about one fourth of all soaps may be made from oil or natural gas. (4)

(1) Pearl, W., "Oil Stocks", P. 10, Pamphlet published by White, Weld & Co., New York City, 1946
(2) Ibid, P. 11
(3) Ibid, P. 11
(4) Russell, R., Pres. Standard Oil Development Co., Speech given at Annual Meeting of Southern Research Institute, Birmingham, Ala., Nov. 26, 1946. Reported in the Wall Street Journal, Nov. 27, 1946

[1] Ibid., p. 11
[2] Ibid., p. 11
[3] Ibid., p. 11
[4] Lindell, J., Ibid. Excerpt 011 Correspondence to J. Cyril Glass re Lindell Lecture of Northern Insurance Institute, Birmingham, Eng., Nov. 6th, 1964. Reported in the Lloyd's Journal, Nov. 27, 1964

Along with the continued growth of the automobile industry, the development of aviation has increased the demand for gasoline, particularly those grades having a higher octane rating. The recent global conflict, which was fought on a highly mechanized basis, greatly increased the demand for oil products, particularly high-octane fuel for airplanes. The development of the Diesel engine and the increasing popularity of heating homes by means of fuel oil has increased the demand for distillate fuel oils.

The higher costs of bituminous coal has resulted in the decision of many railroads to gradually change over from steam to Diesel powered locomotives as the former types wear out. In fact as of October 1, 1946, unfilled orders for locomotives amounted to 484, 86% of which were for Diesels. (1) Although many public utility steam generating plants have been equipped with oil burning equipment such capacity is at present mainly for emergency use as bituminous coal is still the cheaper of the two fuels for the generation of electricity by steam.

Contrary to the concensus of opinion in the petroleum industry, 1946 demand for oil products did not slacken but actually showed an increase over 1945. Gasoline consumption in 1946 was about the same as during the peak war year of 1945 even though new car production during 1946 was 50% less than forecast. Consumption of kerosene and other products reached new peaks in 1946. (2)

(1) "Railroad Equipment", Standard & Poor's Industry Surveys, October 23, 1946
(2) "1947 U. S. Demand Will Exceed 1946 Record Requirements", The Oil and Gas Journal, Vol. 45, No. 38, 1947

Along with the continued growth of the petroleum industry, the development of refineries has increased the demand for gasoline, particularly those grades having a higher octane rating. The Phillips Petroleum Company, which was thought to be a highly competitive firm, provided increased the demand for all products, particularly high-octane that for antiknock. The development of the Ethyl engine and the increasing popularity of leading brands by remove of fuel oil has increased the demand for antiknock, which fuel oils.

The highest month of kilowatt-hour fuel has resulted in the construction of many installations to produce more from steam by diesel generator locomotives on the Denver Lyons water mon. On June 14 of October 1, 1944, official orders for locomotives produced in 1944, 200 of 40-ton units for Illinois. (1) Although many public utility whose generating stations have been equipped with oil burning equipment such capacity is in proportion for emergency use in utilization must be with the number of the two fuels for the production of electricity by steam.

Economy in the movement of gasoline in the petroleum industry, like demand for all products did not slacken but actually showed an increase over 1943. Gasoline consumption in 1944 was about the same as during the great war year of 1943 even though the production during 1944 was 20% less than 1943. Consumption of kerosene and other products handled was less in 1944. (2)

(1) "Railroad Equipment", Commerce & Trade Industry Service, October 20, 1944

(2) "1944 U. S. Gasoline Still Exceed Lower Expectations", The Oil and Gas Journal, Vol. 43, No. 34, 1947

It is estimated that in 1947 there will be about a 4.3% increase over 1946 in the consumption of refined petroleum products. This estimate is based upon a continuance of greater gasoline consumption on the part of motor vehicles now in use, the production of at least five million new motor cars in 1947, and a further shift from the burning of coal to the consumption of fuel oil. Peak sales of lubricating oils is also anticipated. (1) Consumption of petroleum products has shown a steady increase for many years. Future estimated demand for petroleum products as compared with consumption in previous years is given in Table IV of Appendix A.

It will be seen that the estimate in Table IV of Appendix A for all petroleum products in future periods shows a steady upward trend. This steady increase in the use of petroleum products to 1965 is based upon a steady increase in the average number of passenger cars in use as well as an upward trend in the use of oil burners.

There has been some doubt raised concerning the ability of the United States oil fields to supply enough crude oil to meet the anticipated domestic demand. It is believed that a free price structure for oil and its products would encourage enough wildcat drilling, development of remote fields, more efficient methods of secondary recovery, etc. to meet demand for a generation. But, with only domestic production available to meet demand, the price structure might become too unbalanced. Thus, it seems likely that imports from South America will be used

(1) "1947" U. S. Demand Will Exceed 1946 Record Requirement", The Oil and Gas Journal, Vol. 45, No. 38, 1947

It is anticipated that in 1967 there will be about 1,000,000 barrels per day of petroleum-derived petrochemicals. This indicates the need for a considerable increase in crude production in the near-by Middle East region and in Iran, the production of Iraq and Saudi Arabia was below that in 1966, and a further step-up in production will be needed to meet the anticipated demand for Fuel oil. Iraq and Saudi Arabia are also exporters. (1) Consumption of petroleum products has already increased for many years. Future estimated demand for petroleum products is analyzed with consideration to population growth in Iran in 1967 of Appendix A.

It will be seen that the estimate in Table 1 of Appendix for all petroleum products in future periods shows a steadily upward trend. This already increases the use of petroleum products in Iran to the level of a steadily increase in the average volume of consumer goods in use as well in an upward trend in the use of oil industry.

There has been some doubt raised concerning the ability of the United States oil fields to supply enough crude oil to meet the multiplied demand. It is believed that in five years extensive for oil and the products which consumers should utilizing development of Iranian fields, more efficient methods of secondary recovery, the increased demand for a generation. But, with only domestic production available to meet demand, the price structure might become low relative. Thus, it seems likely that imports from Saudi Arabia will be need

(1) "IPAP" U. A. Jamaal Will Double 1966 Import Requirements", The Oil and Gas Journal, Vol. 64, No. 24, 1966

to keep petroleum prices from going too much out of line.

The following tabulation shows the production and demand for crude oil in foreign countries:

Table V

Estimated Foreign Crude Oil Production and Demand*

Country	Annual Production Rate**	Total Demand**
Canada and Alaska	7,665	60,590
Mexico	47,085	33,580
Cuba	365	5,475
Total North America (outside U.S.A.)	55,115	99,645
Colombia	21,900	4,380
Trinidad	20,075	11,315
Venezuela and N.W.I.	401,500	41,245
Total Caribbean	443,475	56,940
Argentina	22,630	43,800
Peru	11,680	5,110
Other Latin American Countries	2,920	40,880
Total Other South American Countries	37,230	88,790
Total Western Hemisphere (excluding U.S.A.)	535,820	264,625
Austria	7,300	1,825
France	365	39,420
Germany (excluding Soviet Zone)	4,745	21,900
Great Britain	365	78,840
Hungary	5,475	11,680
Romania	31,025	8,395
Other European Countries (excluding U.S.S.R. and Baltic States)	2,555	75,190
Total Europe (excluding U.S.S.R. and Baltic States)	51,830	237,250
Egypt	9,490	20,440
Iraq	35,040	1,825
Iran	154,030	28,105
Bahrein-Arabia	71,540	4,380
Kuwait	10,950	---
Qatar and Other	***	14,965
Total Near and Middle East	281,050	69,715
China	365	8,760
Burma	730	(22,630
India	2,555	

In 1949 (calendar year) the data 104,000,000 or 12.1%,

The following manufacture [illegible] and [illegible] trade all in foreign currency:

Table 4

Canadian Foreign Trade (at [illegible] and [illegible]

Country	Imports (from [illegible])	Total [illegible]
Canada and Alaska	9,658	[illegible]
Mexico	47,048	[illegible]
Other	[illegible]	5,476
Total North America (including U.S.A.)	56,115	[illegible]
Colombia	21,300	[illegible]
Ecuador	[illegible]	[illegible]
Venezuela and C.A.L.	[illegible]	[illegible]
Other Southern	[illegible]	[illegible]
Argentina	[illegible]	[illegible]
Peru	[illegible]	[illegible]
Other South American Countries	[illegible]	[illegible]
Total South and Central American Countries	[illegible]	[illegible]
Total Western Hemisphere (excluding [illegible])	[illegible]	[illegible]
Austria	[illegible]	[illegible]
France	[illegible]	[illegible]
Germany (including Western Zones)	[illegible]	[illegible]
Great Britain	[illegible]	[illegible]
Hungary	[illegible]	[illegible]
Netherlands	[illegible]	[illegible]
Other European Countries (excluding [illegible] and Asiatic Russia)	[illegible]	[illegible]
Total Europe (excluding [illegible], and Asiatic Russia)	[illegible]	[illegible]
Japan	[illegible]	[illegible]
Iran	[illegible]	[illegible]
China	[illegible]	[illegible]
Australasia	[illegible]	[illegible]
Israel	[illegible]	[illegible]
Other and Other	[illegible]	[illegible]
Total Foreign Trade	[illegible]	[illegible]
Africa	[illegible]	[illegible]
Other	[illegible]	[illegible]
India	[illegible]	[illegible]

Table V Cont'd

Estimated Foreign Crude Oil Production and Demand*

Country	Annual Production Rates**	Total Demand**
Japan	1,460	6,935
Other East and South Asia	365	29,930
Total East and South Asia	5,475	68,255
N.E.I.-Borneo-New Guinea	12,775	365
Total Eastern Hemisphere	331,130	164,250
Total Foreign (excluding U.S.S.R. and Baltic States)	886,950	1,301,195
U.S.S.R. (unofficial estimate)	182,500	182,500
Total World (outside U.S.A.)	1,069,450	1,023,095

*Based On November 1946 Production Rates
**Thousands of Barrels
*** Wells Shut In

Source: Deegan, C. J. and Burns, W.W., "World Oil Operations", The Oil and Gas Journal, Vol. 45, No. 34, 1946

Canada, France and Great Britain are small producers of oil and have to import large amounts of petroleum products each year. The Caribbean and Middle Eastern Areas are exporters of petroleum while Europe and the South Asia Areas are heavy importers of oil. It is estimated that Russia produces about as much as consumed.

Standard Oil Company (New Jersey) has estimated that over the next two decades, production of the Western Hemisphere will just about equal the demand in that hemisphere. (1)

Excluding Russia, total world demand for crude oil in 1946 was about 2.63 billion barrels. It is estimated that by 1950 world demand

(1) Burns, W. W., "Second Major Middle East Deal Disclosed: Jersey Socony to Buy Iranian Crude", The Oil and Gas Journal, Vol. 45, No. 35, 1946

Table 9 (cont'd)

Twelve-nation Foreign Trade Oil Production and Demand

Country	Annual Production	Total Demand
Japan	1,[illegible]	[illegible]
Other Near and Middle East	[illegible]	[illegible]
Total Free and South Asia	[illegible]	[illegible]
S.E.I.-Bloc-Non Communist	[illegible]	[illegible]
Total Western Hemisphere	[illegible]	[illegible]
Total Foreign (excluding U.S.S.R. and Eastern Europe)	[illegible]	[illegible]
U.S.S.R. (unaffected estimate)	[illegible]	[illegible]
Total World (outside U.S.S.R.)	[illegible]	[illegible]

Added in November 1962 transactions below
estimates of barrels
are lists that be

Stewart Jaques, D. J. and Burns, R.E., "World Oil Operations", The Oil and Gas Journal, Vol. 60, No. 34, 1962

Canada, France and Great Britain are small producers of oil and have to import large amounts of petroleum products each year. The Netherlands and Middle Eastern areas are exporters of petroleum while Europe and the South Asia areas are heavy importers of oil. It is estimated that Shell's problems about as much as usual.

Standard Oil Company (New Jersey) has estimated that over the next two decades, production of the Western Hemisphere will just about equal the demand in that hemisphere. (1)

Including Canada, total world demand for crude oil in 1962 was about 5.65 billion barrels. It is estimated that by 1980 world demand

(1) Burns, R. E., "Demand Major Middle East Oil Estimated: Jersey Company Sees Big Western Trade", The Oil and Gas Journal, Vol. 60, No. 34, 1962

for petroleum (excluding Russia) will have increased 16% to 3.05 billion barrels annually. (1) However, with 1947 world consumption of crude oil running at a greater rate than estimated late in 1946, world demand for crude oil in 1950 may be even greater than anticipated.

(1) Holman, E., President Standard Oil Company, (New Jersey), Speech at National Association of Manufacturers in New York City, December 9, 1946, reported in The Wall Street Journal, December 10, 1946

for petroleum (excluding kerosene) will have increased 300 to 4.75 million barrels annually. (1) However, with 1947 marked consumption of crude oil running at a greater rate than estimated here in 1946, total demand for crude oil in 1950 may be even greater than anticipated.

(1) Holman, E., President Standard Oil Company, (New Jersey), Speech at National Association of Manufacturers in New York City, December 5, 1946, reported in The Wall Street Journal, December 10, 1946

D. Effects of World War II

To meet war demands production of crude petroleum in the United States was increased substantially. In 1937 the rate of production in this country was 1.279 billion barrels while in the period of January-August 1945, a peak annual rate of 1.758 billion barrels was reached. (1) Most of this increased production came from new wells drilled in existing fields, while only a small amount was due to the discovery and development of new fields. (2) Proration was relaxed generally and increased production was thus achieved. Some of this production was at such a rate that it would have damaged some of the oil fields if continued for any length of time. With the termination of hostilities producers of crude oil had few problems in respect to reconversion.

The refining industry entered the war years with ample facilities. At the end of 1939, the industry had an annual capacity of 1.53 billion barrels of crude oil but actual refinery runs were at the yearly rate of 1.24 billion barrels. At the end of 1944, the annual refinery capacity had risen to 1.79 billion barrels while actual runs of crude to stills were at the rate of 1.68 billion barrels. (3) A large part of this increase in capacity was achieved by rehabilitating idle units and by handling greater than rated capacity volumes. Wartime demands changed the relative output of gasoline, fuel oil and kerosene by refineries. The refineries also had the immense task of producing enormous amounts of

(1) Bell, D., Simpson, K., Mikol, V., "Petroleum", P. 47, United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1946
(2) Ibid, P. 47
(3) Ibid, P. 59

5. Effects of World War II

The post war financial prosperity of urban patronage in the United States was increased substantially. In 1937 the rate of production in this country was 1.279 billion barrels annually in the period of January-August 1945, a peak annual rate of 1.780 billion barrels was reached. (1) Part of this increased production came from new wells drilled in existing fields, while only a small amount was due to the discovery and development of new fields. (2) Prorationing was relaxed generally and increased production was thus achieved. Some of this production was at such a rate that it would have exhausted some of the oil fields if continued for any length of time. With the termination of hostilities production of crude oil had few problems in respect to reconversion.

The refining industry entered the war years with ample facilities. At the end of 1939, the industry had an annual capacity of 1.63 billion barrels of crude oil but actual refinery runs were at the yearly rate of 1.04 billion barrels. At the end of 1944, the annual refinery capacity had risen to 1.77 billion barrels while actual runs of crude in utility were at the rate of 1.02 billion barrels. (3) A large part of this increase in capacity was achieved by rehabilitating idle units and by installing greater than rated capacity volume. Wartime demands changed the relative output of gasoline, fuel oil and kerosene by refineries. The refineries also had the immense task of producing enormous amounts of

(1) Hall, L., Simpson, A., Ubbel, T., "Petroleum", P. 67, United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1948
(2) Ibid, P. 67
(3) Ibid, P. 80

a new product-- 100-octane gasoline for aviation purposes. To do this, the refining industry installed a substantial amount of new equipment at existing refineries without increasing thruput capacity very much. (1)

During the war period about 998 million dollars was invested in refinery equipment, 37% of which was used for making aviation gasoline. Other facilities built were toluene, lubricating and miscellaneous plants. Of the total spent for refinery equipment the government financed about 26%, private industry accounting for the balance. (2) Wartime demands for aviation gasoline enormously increased the catalytic cracking process capacity, which was increased from one installation in 1941 to sixty in 1944. (3)

World War II had a profound effect upon the transportation division of the petroleum industry. In the years immediately preceding the war the refineries received about 75% of their crude oil by pipe lines, 22% by tankers and about 3% by tank cars and trucks. The use of pipe lines for moving gasoline to consuming centers had grown until 111 million barrels, or one-sixth of total gasoline produced was delivered by this method in 1941. (4)

In 1940-41 about 90% of the Atlantic Coast deliveries of petroleum products was accomplished by means of tankers. (5) Because of

(1) Bell, D., Simpson, K., Mikol, V., "Petroleum", P. 59, United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1946
(2) Ibid, P. 60
(3) Ibid, P. 60
(4) Ibid, P. 68-69
(5) Ibid, P. 68-69

a new product-- 100-octane gasoline for aviation purposes. In its turn, the refining industry instituted a substantial amount of new equipment at existing refineries without increasing thereby appreciably very much. (1)

During the war period about 300 million dollars was invested in refinery equipment, 85% of which was used for aviation production. Other facilities built were tolueneu, butadiene and chemicals plants. Of the total spent for refinery equipment the petroleum financed about 30%, private industry accounting for the balance. (2) Wartime demands for aviation gasoline accordingly increased the catalytic cracking process capacity, which was increased from one installation in 1941 to ninety in 1944. (3)

World War II had a profound effect upon the transportation division of the petroleum industry. In the years immediately preceding the war the railroads received about 70% of their crude oil by pipe lines, 22% by tankers and about 8% by tank cars and trucks. The use of pipe lines for moving gasoline in commercial carriers had grown until 111 million barrels, or one-sixth of total gasoline production was delivered by this method in 1941. (4)

In 1940-41 about 90% of the Atlantic Coast deliveries of petroleum products was accomplished by means of tankers. (5) Because of

(1) Belt, R., Simpson, E., Sibol, V., "Petroleum", P. 58, United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1946
(2) 1944, P. 54
(3) 1944, P. 85
(4) 1944, P. 92-93
(5) 1944, P. 93-95

the effectiveness of German submarine warfare, and because tankers were withdrawn for overseas service, tanker delivery of oil products to Atlantic ports dropped to a mere trickle in 1942. To cope with this situation the United States Government invested practically 1.750 billion dollars in tripling the size of the tanker fleet. (1) Many of these Government-built tankers have, since the War's end, been sold to private oil companies.

To facilitate the urgent movement during the war years, of crude oil and refined products from the Southwest to the Atlantic coast, two pipelines, "Big Inch" and "Little Big Inch" were constructed with Federal Funds. The "Big Inch" pipeline transported crude oil from Longview, Texas to Linden, New Jersey while the "Little Big Inch" transported refined products and extended from Beaumont, Texas to Linden, New Jersey. After considerable discussion these two pipelines have been sold to private industry and are currently being used to transport natural gas. Today's domestic pipeline mileage is about 142,000 miles and is expected to increase to 150,000 miles by 1948. (2) It is estimated that the present pipeline mileage transports the equivalent of about one-ninth of all freight tonnage moved in the United States. (3)

Of course, oil production and refining facilities in certain foreign countries and areas suffered quite badly as a result of hostil-

(1) Bell, D., Simpson, K., Nikol, V., "Petroleum", P. 73 and 13, United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1946
(2) Spann, R., "Pipe Line Plans", The Wall Street Journal, November 29, 1946
(3) "The Lamp", January, 1947, Publication by Standard Oil Company, (New Jersey)

the effectiveness of German submarine warfare, and German tankers were withdrawn for overseas service, tanker delivery of oil products to Atlantic ports dropped to a zero trickle in 1943. In sum with this exception the United States Government invested practically 1.750 million dollars in bringing the size of the tanker fleet. (1) Many of these government-built tankers have, since the war's end, been sold to private oil companies.

To facilitate the urgent movement during the war years, of crude oil and refined products from the southwest to the Atlantic coast, two pipelines, "Big Inch" and "Little Big Inch" were constructed with Federal funds. The "Big Inch" pipeline transported crude oil from Longview, Texas to Linden, New Jersey while the "Little Big Inch" transported refined products and extended from Beaumont, Texas to Linden, New Jersey. After considerable discussion these two pipelines have been sold to private industry and are correctly being used to transport natural gas. Today's domestic pipeline mileage is about 122,000 miles and is expected to increase to 150,000 miles by 1955. (2) It is estimated that the present pipeline mileage transports the equivalent of about one-sixth of all freight tonnage moved in the United States. (3)

Of course, oil production and refining facilities in certain foreign countries had been suffered quite badly as a result of hostili-

(1) Hall, G., Simpson, J., Ethni, V., "Tankships", p. 78 and 12, United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1946

(2) Sperm, K., "Pipe Line Plans", The Wall Street Journal, November 22, 1946

(3) "The Lamp", January, 1947, Publication by Standard Oil Company, (New Jersey)

ities. The wartime damage to the important areas has been noted earlier in this chapter.

E. Petroleum Contrasted to Other Sources of Energy

Over a period of years petroleum has increased its proportionate share of furnishing the energy requirements of the United States. The following table shows the growing importance of petroleum as a source of energy;

Table VI

Sources of Energy in The United States*

Percent of Total

Year	Coal Anthracite	Coal Bituminous	Domestic Oil	Natural Gas	Water Power
1901-1905	18.0%	70.6%	6.1%	3.2%	2.1%
1911-1915	14.4	69.0	8.9	3.7	3.5
1921-1925	9.9	59.2	13.2	4.8	5.2
1931-1935	7.3	48.1	26.7	9.1	8.6
1940	5.1	44.2	29.7	10.5	9.6
1941	5.2	45.6	28.5	10.2	9.5
1942	5.1	47.6	25.9	10.2	10.9
1943	4.9	45.6	26.6	10.8	11.8
1944	4.8	44.6	27.7	11.2	11.0
1945	4.2	42.8	29.1	10.4	12.3

*Fuel equivalent: Anthracite-13,000 B.t.u. per lb.; Bituminous coal-13,100 B.t.u. per lb.; Petroleum-6,000,000 B.t.u. per bbl.; and natural gas-1,075 B.t.u. per cu. ft.

Source: United States Bureau of Mines and Bituminous Coal Division, Printed in "Coal", P. 3, Standard & Poor's Industry Surveys, July 23, 1946

Anthracite coal is largely used for home heating and its use will continue to decline as oil heating units are installed. Based upon the current consumption rate, there are in the ground about one hundred sixty years supply of anthracite. (1) Because of convenience and the growing price advantage of fuel oil over anthracite, there has been a

(1) "Coal", P. 4, Standard & Poor's Industry Surveys, August 24, 1946

5. Petroleum Gradually Gains Greater Sources of Energy

Over a period of years petroleum has increased its proportionate share of furnishing the energy requirements of the United States. The following table shows the growing importance of petroleum as a source of energy:

Table VI

Sources of Energy in The United States

Percent of Total

Year	Anthracite	Bituminous Coal	Domestic Oil	Natural Gas	Water Power
1901-1905	14.0%	70.0%	6.1%	2.0%	1.1%
1911-1914	14.4	69.0	8.9	4.7	2.8
1921-1924	9.0	59.2	12.2	6.3	3.2
1931-1934	7.5	46.1	22.7	9.1	3.6
1940	5.1	44.2	29.7	10.3	3.6
1941	5.2	44.6	28.5	10.2	3.6
1942	5.1	47.4	28.9	10.2	10.9
1943	4.8	48.4	26.9	10.0	11.8
1944	4.4	44.0	27.7	11.2	11.0
1945	4.2	43.4	29.1	10.4	12.8

Fuel equivalent: anthracite-12,400 B.t.u. per lb.; bituminous coal-13,100 B.t.u. per lb.; Petroleum-6,000,000 B.t.u. per bbl.; and natural gas-1,000 B.t.u. per cu. ft.

Source: United States Bureau of Mines and Bituminous Coal Division, Printed in "Coal", p. 3, Standard & Poor's Industry Survey, July 23, 1948

Anthracite coal is largely used for home heating and its use will continue to decline as oil heating units are installed. Based upon the current consumption rate, there are in the ground about one hundred sixty years supply of anthracite. (1) Because of conservation and the growing price advantage of fuel oil over anthracite, there has been a

(1) "Coal", p. 4, Standard & Poor's Industry Survey, August 24, 1948

marked trend away from the use of anthracite coal as a source of energy. As of the end of 1946 unfilled orders for flue-connected oil burning space heaters totalled 1.6 million. This represents future increased demand for fuel oil amounting to about one billion gallons annually. (1)

Today, the largest users of bituminous coal are the railroads, public utilities and the iron and steel industry. Successive rises in the price of soft coal have heightened the fear that this source of energy is pricing itself out of its markets. There is a definite trend on the part of the railroads to replace worn out steam locomotives with oil burning Diesel engines. (2) The electric utilities are increasing their consumption of fuel oil in their steam generating plants. In 1920, based upon a comparison of their relative British thermal unit values, oil and gas used as fuel by electric utilities displaced the equivalent of 3,216,000 tons of coal. It is estimated that in 1946 the soft coal displaced by oil and gas amounted to about 20,840,000 tons. (3) Many of the utilities are installing oil burning equipment and have plans for erecting oil storage tanks as soon as they become available. The oil burning equipment is used mainly for emergency use in case of failure of coal deliveries. (4) The price differential between bituminous coal and oil determines the practicality for use of fuel oil instead of soft coal. Between 1930 and 1945, the mine price of coal increased 46% while

(1) Farrell, M., "Oil vs. Coal", The Wall Street Journal, September 26, 1946
(2) "Railroad Equipment", P. 4, Standard & Poor's Industry Surveys, October 23, 1946
(3) Farrell, M., "Oil vs. Coal", The Wall Street Journal, September 26, 1946
(4) Toner, J., President Boston Edison Company, Talk before the Boston Security Analysts Society, Boston, Mass., December 16, 1946

market based only from the use of substitute coal as a source of energy. As of the end of 1964 modified orders for Con-commended oil burning power stations totalled 1.0 million. This requirements future increased demand for fuel oil accounting to nearly one million gallons annually. (1)

Today, the largest users of bituminous coal are the railroads, public utilities and the iron and steel industry. Concerning fuel in the price of coal some background the fact that this source of energy is yielding itself out of the problem. There is a definite trend on the part of the railroads to replace very old steam locomotives with oil burning Diesel engines. (2) The electric utilities are increasing their consumption of fuel oil in their steam generating plants. In 1960, based upon a comparison of their relative British thermal unit values, oil was used as fuel by electric utilities displaced the equivalent of 2,110,000 tons of coal. It is estimated that in 1964 the well coal displaced by oil was measured to about 20,000,000 tons. (3) Many of the utilities are installing oil burning equipment and have plans for erecting oil storage tanks or ponds in lieu become available. The oil burning equipment is used mainly for emergency use in case of failure of coal conveyors. (4) The price differential between Pittsburgh coal and oil influences the practicability of use of fuel oil instead of coal. Between 1950 and 1964, the sales price of coal increased 18% while

(1) Purcell, E., "Oil vs. Coal", The oil street journal, September 22, 1964

(2) "Railroad Customers", I. A., Standard & Poor's Industry surveys, December 23, 1964

(3) Purcell, E., "Oil vs. Coal", The oil street journal, September 22, 1964

(4) Stone, J., Pittsburgh Steelers Edison Company, Talk before the Pittsburgh Analysts Society, Boston, Mass., December 16, 1964

the price of fuel oil at the refinery increased 33% and the delivered price of natural gas decreased 20%. Successive rises in the price of soft coal and rail transportation costs have tended to increase the competitive advantage of oil and gas. The coal industry is also plagued by higher marketing costs due mainly to increasing rail charges while the cost of marketing competing fuels is dropping. (1)

The capital goods industries are large users of soft coal. It is one of the essential raw materials in the manufacture of pig iron. It is also used in the manufacture of coke and its main by-product, manufactured gas, is sold to a great extent for home heating purposes. Of all the underground mineral reserves in the United States, bituminous coal is the most bountiful. Based upon the current consumption rate, over 1,000 years supply of soft coal still remains to be mined. (2)

Another use to which soft coal can be put is the manufacture of liquid fuels. During the recent war Germany manufactured a large part of its gasoline requirements from coal. Already in this country, improvements have been made to produce liquid fuels more economically than did Germany. At the present time synthetic gasoline can be produced from soft coal at about double the present cost of refined gasoline which is about six cents per gallon. (3) In the near future, it is believed that synthetic gasoline will be made at just a slightly higher cost than refined gasoline. At the present time the largest domestic

(1) Cowan, D., Consultant Economist for National Coal Association, "Coal's Position", The Wall Street Journal, January 6, 1947
(2) "Coal", P. 4, Standard & Poor's Industry Surveys, August 24, 1946
(3) Wilson, R. L., "Supply and Demand Outlook", Petroleum Requirements-Postwar, Published by United States Government Printing Office 1946

the price of fuel oil at the refinery increased 50% and the delivered price of natural gas increased 200%. Incentive plays in the price of both coal and oil transportation costs have helped to increase the competitive advantage of oil and gas. The coal industry is also plagued by higher marketing costs due mainly to increasing rail charges while the cost of marketing competing fuels is dropping. (1)

The capital goods industries are large users of both coal. It is one of the essential raw materials in the manufacture of pig iron. It is also used in the manufacture of coke and the coke by-product, manufactured gas, is sold to a great extent for home heating purposes. Of all the underground mineral reserves in the United States, bituminous coal is the most bountiful. Based upon the current consumption rate, over 1,000 years supply of soft coal still remains to be mined. (2)

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(1) Cowen, D., Consultant Economist for National Coal Association, "Coal's Problem", The Wall Street Journal, January 6, 1957
(2) "Coal", F. A., Research & Power Industry Survey, August 24, 1956
(3) Gilson, H. L., "Supply and Demand Outlook", Petroleum Refining Industry, Published by United States Government Printing Office 1949

oil company is devoting about one-third of its research efforts toward more economical extraction of liquid fuels from natural gas and coal. (1) The reason for this effort is that the cost of finding and producing oil is rising and large reserves of natural gas and coal already exist and are easily accessible.

Today, synthetic gasoline from natural gas can be produced at the same cost of a gallon of gasoline refined from crude oil. (2) By expending only one-third of the present proved reserves of natural gas at the rate of 4% per annum about 30%, or 500,000 barrels daily of our prewar gasoline consumption could be produced. Also similar processes could produce high quality Diesel fuel, wax and large amounts of chemical by-products from natural gas. (3) In recent years the production of natural gasoline, which is produced from natural gas, has shown sharp increases.

Where available in quantity, natural gas is competitive with oil and coal. In 1945 about 4 1/2 trillion cubic feet of natural gas were sold. This volume is equivalent in heat value to about 170 million tons of coal. It is used by about 40 million people residing in 34 states. Its uses in industry number over 20,000. Thus, while natural gas is definitely a growing competitor to the oil industry it should be noted that a large portion of the gas reserves are owned by the major

(1) Holman, E., President Standard Oil Company (N.J.), Speech at Annual Meeting of American Petroleum Institute, Chicago, Illinois, November 15, 1946, Reported in The Wall Street Journal, November 16, 1946
(2) Wilson, R. E., "Synthetic Gasoline from Gas"., Petroleum Requirements-Postwar, Published by United States Government Printing Office, 1946
(3) Ibid, P. 69

oil companies. (1)

Long range sources of energy are oil located beneath the continental shelves and slopes of the world and from oil shale and tar sands. Oil well drilling activity on these shelves off the Gulf and California coastlines has been active in recent years and promises to increase in the near future. The oil shale is located in large deposits in the Western States while the tar sands in tremendous deposits are located in Canada. Since both deposits are considerable distances from consuming areas their ultimate use will depend upon transportation costs and it seems likely that the use of coal deposits would come first. (2)

It is the opinion of scientists and engineers that the application of atomic fission for power purposes is now technically practical. (3) It is estimated that, for example, a 100,000-kw plutonuim-fueled nuclear power plant could be installed for around $11,100,000 as compared to $13,200,000 for a 20,000-kw coal-fired power plant. Operating costs are likewise estimated to be less for the nuclear plant. Comparative estimated costs are $2,970,000 for the plutonuim-fueled power plant and $3,340,000 for the coal-fired plant. (4)

If needed, coal deposits can furnish a plentiful supply of liquid fuel for over a thousand years. It is quite reasonable to expect

(1) Ebert, S., "Natural Gas Industry Plans Big Expansion", Barron's, The National Financial Weekly, October 7, 1946
(2) Wilson, M. E., "Oil Shales and Tar Sands", Petroleum Requirements-Postwar, Published by United States Government Printing Office 1946
(3) "Competitive Atom", Report of Committee on Atomic Energy of the Carnegie Endowment for International Peace, Reported in Business Week, October 26, 1946
(4) Ibid

oil resources. (1)

Large scale ventures of energy are oil lawmen because the mainland always has slopes of the world and from oil shale and tar sands. Oil well drilling activity on these shales all the gulf and California coastlines has been active in recent years and promises to increase in the near future. The oil shale is located in large deposits in the Western States while the tar sands in Canadian deposits are located in Canada. Since both deposits are considerable distance from industrial areas their difficulties has will depend upon transportation costs but is seems likely that the use of oil shale would come first. (2)

In the opinion of scientists and engineers that the application of atomic fission for power production is now technically practical. (3) It is estimated that, for example, a 100,000-kw plutonium-breeding power plant would be installed for around $12,000,000 as compared to $11,000,000 for a 80,000-kw uranium-fired power plant. Operating costs are likewise estimated to be less for the nuclear plant. Comparative costs thereof such are $8,870,000 for the plutonium-breeding power plant and $8,800,000 for the coal-fired plant. (4)

If needed, coal deposits can furnish a plentiful supply of liquid fuel for over a thousand years. It is quite reasonable to expect

(1) Ibert, L., "Natural Gas Industry Plays Oil Speculator", Barron's, The National Financial Weekly, October 7, 1949

(2) Williams, H. R., "Oil Shale and Tar Sands", Petroleum Encyclopedia, Published by Petroleum Publications Inc., 1949

(3) "Nuclear Fission", Report of Special Committee on Atomic Energy of the Canadian Commission for International Trade, reported in Financial Post, October 22, 1949

(4) Ibid

that before the world's petroleum resources are consumed that other more economical sources of energy will be developed by our scientists. (1)

(1) Wilson, R. E., "Technology May Find Other Sources", Petroleum Requirements-Postwar, Published by United States Government Printing Office, Washington, D. C. 1946

F. Economic Outlook

Ranking as the fourth largest industry in terms of capital investment in the United States, petroleum as a source of energy and lubricant is essential in our highly industrialized national and world economy. (1) As the most important product, gasoline is outranked in importance only by the basic essentials of food, clothing and shelter. (2) The secular growth of the oil industry has been aided by the increasing degree of mechanization of our economy and its continued extension into the future will be aided by population growth, increasing transportation requirements, large-scale expansion of residential construction, and increasingly wider use of Diesel power by agriculture, railroads and industrial users of energy. (3)

Leading geologists believe there are 80 billion barrels of crude oil reserves still to be discovered in the United States. (4) In the past, official estimates of oil reserves have always been very conservative. New techniques of production are being developed rapidly and secondary recovery methods are being improved. More efficient refinery operations have increased the yield from crude oil and extensive vigorous research has rapidly multiplied the number of useful by-products derived from oil.

(1) "Oil", P. 2, Standard & Poor's Industry Surveys, November 29, 1946
(2) Ibid, P. 2
(3) "Growth Potentials in the Oil Industry", P. 3, Pamphlet published by Hornblower and Weeks, 75 Federal Street, Boston, Mass. Copyright 1946
(4) Zook, R., former President of Independent Petroleum Association of America, Speech at 1946 Annual Meeting of American Petroleum Institute, Chicago, Illinois, November 15, 1946, Printed in Boston News Bureau, November 16, 1946

F. Liquidable Optimum

Ranking as the fourth largest industry in terms of capital investment in the United States, petroleum is a source of energy and industrial is essential in our highly industrialized national and world economy. (1) As the most important product, gasoline is outstripped in importance only by the basic essentials of food, clothing and shelter. (2) The secular growth of the oil industry has been aided by the increasing degree of mechanization of our economy and its continued extension into the future will be aided by population growth, increasing transportation requirements, large-scale expansion of industrial construction, and increasingly wider use of diesel power by agriculture, railroads and industrial users of energy. (3)

Leading geologists believe there are 50 billion barrels of crude oil reserves still to be discovered in the United States. (4) In the past, official estimates of oil reserves have always been very conservative. New techniques of production are being developed rapidly and secondary recovery methods are being improved. More efficient refinery operations have increased the yield from crude oil and extensive exploration has rapidly multiplied the number of useful by-products derived from oil.

(1) "Oil", p. 2, Standard Oil Co. (New Jersey) (1950)
(2) Ibid., p. 2
(3) "Growth Potentials in the Oil Industry", p. 2, reprint published by Petroleum and Chemicals, Inc. Federal Trust, Boston, Copyright 1962
(4) Cook, W., Former President of Independent Petroleum Association of America, Speech at 1959 Annual Meeting of American Petroleum Institute, Chicago, Illinois, November 16, 1959, Printed in Oil and Gas Journal, November 16, 1959

Our technicians and scientists will undoubtedly develop or discover new and supplementary sources of energy, such as atomic fission or more economical extraction of liquid fuels from coals and shales. However, as an economical portable fuel and as a new and low cost source of raw material for the chemical industry, petroleum will continue to retain its important role in our domestic and world economy. (1)

(1) Pearl, S., "Oil Stocks", P. 7, Pamphlet published by White, Weld & Co., New York City, 1946

Our institutions and methods will undoubtedly develop or disappear but a significant portion of society, such as stocks listing or more economical extraction of light from coals and shales. Moreover, is it conceivable that not in a far off but long over-run of the material for the standard industry, petroleum will continue to remain the indispensable role in our dynamic and world economy. (3).

(1) Ewart, R., "Oil Shale", P. 7, Pamphlet published by Mobile Oil Co., New York City, 1968

G. Producing, Refining and Distributing Companies versus Integrated Companies

A company whose main business is that of discovery, developing and producing crude oil has an advantage that a refining or distributing company does not enjoy. Today, the stability of the price of crude oil is to a large measure determined by proration practices of several states as well as the rate of new oil discoveries and demand for crude oil. Under the state proration system the volume of production of crude oil is based upon an estimate of the demand for refined products. Thus, the crude oil producers are assured of stability in the price of crude oil. Over a period of years, many crude oil producers have been able to discover and develop large low-cost reserves which at present high prices are netting sizeable profits.

Relatively speaking, production costs of crude oil are stable, although in recent years these costs have shown a rising trend. (1) Costs of crude oil production are dependent upon such factors as well depth, productivity per well, proration and regulation of oil field development, improvements in oil well drilling techniques and costs of labor and materials. A crude oil producer's profits are not dependent upon the price structure of refined products which is seldom stable for any length of time.

An oil refiner which does not produce its own crude oil has little protection from an advance in crude oil prices. Prices for refined products fluctuate in accordance with the relation of supply to

(1) "Oil", P. 7, Standard & Poor's Industry Surveys, November 29, 1946

d. Producing, refining and distributing
Companies varies integrated companies

A company above mentioned business is that of discovery, developing and producing crude oil has an advantage that a refining or distributing company does not enjoy. Thus, the availability of the price of crude oil is to a large measure determined by production primitives of several states as well as the rate of new oil discoveries and demand for crude oil. Under this state production system the volume of production of crude oil is based upon an estimate of the demand for refined products. Thus, the crude oil producers are exposed of stability in the price of crude oil. Over a period of years, many crude oil producers have been able to discover and develop large low-cost reserves which at present high prices are yielding attractive profits.

Relatively speaking, production costs of crude oil are stable, although in recent years these costs have shown a rising trend. (1) Costs of crude oil production are dependent upon such factors as well depth, productivity per well, proration and regulation of oil field development, improvements in oil well drilling techniques and costs of labor and materials. A crude oil producer's profits are not dependent upon the price structure of refined products which is sudden viable for any length of time.

An oil refiner which does not produce the own crude oil has little protection from an increase in crude oil prices. Prices for refined products fluctuate in accordance with the relations of supply to

(1) "Oil", E. T. Standard & Poor's Industry Survey, November 25, 1964

demand for refined products, and refined costs have little influence on retail prices. (1) Gross profit margins of oil refiners are unstable and only remain favorable for relatively short periods. (2)

Distributing companies have the problems of over-expanded marketing facilities accompanied by severe competition. Seasonal demand creates excessive inventories of some refined products since one product cannot be obtained without producing the others. For example, gasoline consumption is greatest in the summer while demand for fuel oils is largest in the winter. Often times excessive accumulations of inventories of off-season products results in a softening of prices thereby causing lower marketing profits. (3)

Integrated companies are best able to cope with the problems besetting the crude oil producer, refiner and distributor of refined products. An integrated company, through its own efforts can develop its own source of crude oil, thus assuring itself an adequate supply of crude and a stable and reasonable price. Being assured of an adequate supply of petroleum its refineries can be operated more efficiently. Again, knowing its probable output of refined products, an integrated company can better develop and service its marketing system. It is estimated that three-quarters of the petroleum business is done by integrated companies. (4)

(1) "Oil", P. 11, Standard & Poor's Industry Surveys, November 29, 1946
(2) Ibid, P. 11
(3) Ibid, P. 14
(4) Ibid, P. 18

demand for refined products, but refined oils have little influence on retail prices. (1) Gross profit margins of oil refiners are usually and only remain favorable for relatively short periods. (2)

Marketing companies have the problem of over-expanded refining facilities occasioned by severe competition. General demand market economic conditions of some refined products cause the product market to shrink without producing the effect. For example, gasoline consumption is greatest in the summer while demand for fuel oils is largest in the winter. Often times excessive accumulations of inventories of off-season products results in a softening of prices thereby causing lower marketing profits. (3)

Integrated companies are best able to cope with the problems benefiting the crude oil producer, refiner and distributor of refined products. An integrated company, through its own efforts can develop its own source of crude oil, thus assuring itself an adequate supply of crude and a stable and reasonable price. Being assured of an adequate supply of petroleum its refineries can be operated more efficiently. Again, having the probable output of refined products, an integrated company can better develop and service its marketing system. It is essential that headquarters of the petroleum business is done by integrated companies. (4)

(1) "Oil", p. 11, Standard & Poor's Industry Surveys, November 13, 1948
(2) Ibid., p. 11
(3) Ibid., p. 14
(4) Ibid., p. 12

III. Results of Analysis of Twenty-Five Oil Companies

Under the "Massachusetts Rule" (also called "Prudent Man Rule") trustees may invest in common stocks. (1) Thus, the selection of oil stocks is a matter of analyzing the better grade oil companies to determine which ones are best suited for trust investment.

As a result of a detailed statistical comparison of twenty-five oil companies covering the period 1929-1945, it is the writer's opinion that the common stocks of the following eleven companies are suitable for trust investment:

Standard Oil Company (New Jersey)
Gulf Oil Corporation
The Texas Company
Humble Oil and Refining Company
Amerada Petroleum Company
The Atlantic Refining Company
Sun Oil Company
Standard Oil Company of California
Phillips Petroleum Company
Continental Oil Company
Standard Oil Company (Indiana)

All but one of the above companies are integrated and in most cases are among the leaders in the petroleum industry.

After studying the status of each of these companies in great detail in an effort to select the best four, the following companies were eliminated:

Humble Oil and Refining Company - While in a very strong position statistically, this company's common stock has always sold for a low yield, relatively speaking. Since this company is seventy percent owned by Standard Oil Company (New Jersey) an investment in the parent

(1) See Appendix B

III. Results of Analysis of Twenty-Five Oil Companies

Under the "Massachusetts Rule" (also called "Prudent Man Rule") trustees may invest in common stocks. (1) Thus, the selection of oil stocks is a matter of analyzing the better grade oil companies to determine which ones are best suited for trust investment.

As a result of a detailed statistical comparison of twenty-five oil companies covering the period 1923-1948, it is the writer's opinion that the common stocks of the following eleven companies are suitable for trust investment:

Standard Oil Company (New Jersey)
Gulf Oil Corporation
The Texas Company
Mobile Oil and Refining Company
Amerada Petroleum Company
The Atlantic Refining Company
Sun Oil Company
Standard Oil Company of California
Phillips Petroleum Company
Consolidated Oil Company
Standard Oil Company (Indiana)

All but one of the above companies are integrated and in most cases are among the leaders in the petroleum industry.

After studying the status of each of these companies in great detail in an effort to select the best four, the following companies were eliminated:

Mobile Oil and Refining Company - While in a very strong position statistically, this company's common stock has always sold for a low yield, relatively speaking. Since this company is seventy percent owned by Standard Oil Company (New Jersey) an investment in the parent

(1) See Appendix B

company's common stock will give the investor an interest in Humble Oil and Refining Company at a larger yield. It will also give the investor an interest in foreign oil development as well as leadership in the oil industry.

Amerada Petroleum Company - This company is a small and non-integrated crude oil producer having a fairly good statistical position. It sells at a high price-earnings ratio and at a low yield. It lacks diversification and has no foreign oil interests.

The Atlantic Refining Company - Although the company has done an outstanding job in improving its statistical position mainly through reinvestment of earnings, a continued need for capital borrowing decreases the enhancement of earning power per common share. The stock sells for a relatively low yield and the company still produces only 57% of its refinery needs of crude oil. This ratio of crude oil production to refinery requirements is low when compared to the ratios of the four companies selected as being best suitable for trust investment. This company also has very small foreign oil interests.

Sun Oil Company - This is a small company doing buisness only in the United States and produces only 47% of the crude oil needed to meet its refinery requirements. It has retained about 90% of its cash earnings in an effort to improve its position in the petroleum industry. Its common stock sells at a very low yield and at a fairly high price-earnings ratio.

Standard Oil Company of California - This is one of the largest fully integrated oil companies, having large crude oil reserves in Saudi Arabia. It produces 70% of its domestic crude oil from Californi-

company's common stock will give the investor an interest in Mobile Oil and refining company at a larger yield. It will also give the investor an interest in foreign oil investments as well as interests in the oil industry.

Imperial Refineries Company - This company is a small but well-integrated crude oil producer having a fairly good profitability position. It sells at a high price-earnings ratio and at a low yield. It lacks diversification and has no foreign oil interests.

The Atlantic Refining Company - Although the company has done an outstanding job in improving its financial position during strong refinery conditions of scarcity, a continued need for capital investing decreases the attractiveness of certain power or common stocks. The stock sells for a relatively low yield and the company still produces only 82% of the refinery needs of crude oil. This ratio of crude oil production to refinery requirements is low when compared to the ratios of the four companies selected as being least profitable for their investment. This company also has very small foreign oil interests.

Sun Oil Company - This is a small company doing business only in the United States and produces only 41% of the crude oil needed to meet the refinery requirements. It has invested about 70% of its assets according to an effort to improve its position in the petroleum industry. The common stock sells at a very low yield and at a fairly high price-earnings ratio.

Standard Oil Company of California - This is one of the largest and fully integrated oil companies, having large crude oil reserves in Saudi Arabia. It produces 70% of the Aramco crude oil from unfavora-

an fields but in recent years has been unsuccessful in finding new reserves in California and is pushing development of fields in states east of California. A very fine company in all other respects, the writer is of the opinion that this company is a shade less attractive than the four companies retained as being best suited for the investment of trust funds.

Continental Oil Company - Although this company has spent considerable sums on property, its increase in production of crude oil is not as impressive as that of other companies. It has no foreign oil interests and only average crude oil reserves in this country.

Standard Oil Company (Indiana) - Although one of the largest integrated oil companies, its lack of foreign oil interests, less than average crude oil reserves and low ratio of crude oil production to refinery requirements make this company's stock less attractive as a trust investment than the stocks of some other oil companies.

For years a number of the larger oil companies have invested money in oil properties in foreign countries. The following table shows total gross assets invested abroad:

Table VII

Gross Assets Employed Abroad by United States Oil Companies, By Function, 1935 and 1944

Function (000 omitted)	1935	1944
Exploration and Production	$516,476	$1,040,170
Refining	300,526	386,290
Transportation	111,872	156,546
Marketing	743,317	581,226
All Others	389,822	205,758
Total	2,062,013	2,369,990

Source: The Petroleum Almanac, P. 348, 1946

an Florida but is toward later the best demonstrated in finding the prospects in California and in pushing development of fields in states east of California. A very fine company in all other respects, the writer is of the opinion that this company is a whole less attractive than the four companies related as being best suited for the investment of funds.

Continental Oil Company - Although this company has great attractive even on property, the increase in production of crude oil is not as impressive as that of other companies. It has no foreign oil interests and only average crude oil reserves in this country.

Standard Oil Company (Indiana) - Although one of the largest integrated oil companies, its loss of foreign oil interests, less than average crude oil reserves and low yield of crude oil production in refinery requirements make this company's stock less attractive as a short investment than the stocks of some other oil companies.

For years a number of the larger oil companies have invested money in oil properties in foreign countries. The following table shows total cross assets invested abroad:

Table VII

Cross assets employed abroad by United States oil companies, by Countries, 1929 and 1934

Countries	(000 omitted) 1929	1934
Exploration and Production	1,034,472	1,000,170
Refining	300,056	324,300
Transportation	111,073	114,940
Marketing	74,817	141,324
All Others	120,000	200,172
Total	[illegible]	[illegible]

Source: The Petroleum Almanac, p. 340, 1940

Several companies, namely, The Texas Company, Gulf Oil Corp., Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company intend to make even larger investments in foreign oil properties in the near future. While investments in foreign oil properties will probably enhance the earning power of the oil companies the element of risk due to political factors should be taken into consideration when evaluating the common stocks of oil companies.

It is the author's opinion that, today, the following companies are in the best statistical position and will show better than average performance in the future.

Table VIII

Selected Oil Companies

Market Data	Standard Oil Co. (New Jersey)	Gulf Oil Corp.	Phillips Petroleum	Texas Co.
1946-47 Price Range*	78 3/8-65 3/4	78-56 1/2	75-49	68 1/4-52
Market 2/21/47	66 7/8	60 3/4	56 1/4	59 1/4
1946 Dividends	$3.08	$2.50	$2.00	$2.50
Percent Yield	4.62%	4.12%	3.56%	4.22%

*To 2/21/47

Each company is large and integrated, possesses large crude reserves, and three have substantial foreign interests. The fourth company is the largest factor in the domestic natural gas and natural gasoline business.

The following table shows the relative sizes of the four companies and their asset growth since 1929. Book value per share is also indicated as well as the ratio of market value to book value per share. Also shown is the fact that the funded debt of these companies is small and has in each case been reduced since 1929.

Several companies, namely, the Texas Company, Gulf Oil Corporation, Standard Oil Company (New Jersey) and Sinclair-Texas Oil Company, have made extra large investments in Venezuela in oil properties in the last ten years. Shell investments in Venezuela oil properties will probably exceed the earning power of the oil industry. The attempt of the political forces should be taken into consideration which regulations the economic climate of oil companies.

It is the writer's opinion that, today, the following economic ties in the back statistical position and will also further these expectations in the future.

Table XIII

Selected Oil Companies

Market Data	Capital Stock (New Jersey)	Gross Oil Inc.	Earnings Interests	Total Cos.
1940-47 Price Range	70 1/2-44 3/8	73.50 1/8	74.40	88 1/4-66
Market 1/21/47	66 7/8	65 3/4	62 1/4	65 1/4
1947 Dividend	5.00	80.00	83.00	86.00
Present Yield	4.02%	4.37%	5.44%	4.30%

Source 1/21/47

Such company is large and integrated, possesses large crude reserves, and these have substantial foreign interests. The result consequent is the Company Profit in the economic command and national interest.

The following table shows the relative size of the four companies and their net earnings about 1950. Such ratio per share is also indicative as well as the ratio of earnings which to look ratio on shares. Also shown is the Dow Jones the General Index of Common Industrial and has by much been reduced since 1929.

Table IX

Balance Sheet Data

Items	Standard Oil (New Jersey)	Gulf Oil Corp.	Phillips Petroleum	Texas Co.
Industry Rank of Company (based on 1945 Depreciated Assets)	1	6	9	4
Gross Assets 12/31/45*	$2,441.8	$1,005.7	$495.6	$900.0
Net Depreciated Assets 12/31/45*	$1,137.4	$ 446.7	$222.7	$398.8
Percent Increase 1929-45:				
Gross Assets	84.5	90.2	160.0	71.8
Net Depreciated Assets	55.0	65.0	95.0	28.2
Book Value Per Share 12/31/45	$61.40	$55.85	$48.20	$55.00
Ratio Market Value to Book Value per Share**	108.8%	108.8%	116.5%	107.8%
Ratio Funded Debt and Preferred Stock to Total Capitalization 12/31/29	22.8%	16.1%	26.8%	22.2%
Ratio Funded Debt and Preferred Stock to Total Capitalization 12/31/45	22.4%	10.5%	16.2%	15.6%

*Millions
**Market as of 2/21/47

It will be noted that the market value of the stocks is slightly higher than their respective book values. Standard Oil Company (New Jersey) is by far the largest company in the oil industry as may be seen by a comparison of the assets in the above table. While each company has reduced its ratio of funded debt to total capitalization since 1929, borrowings in 1947 will undoubtedly raise these ratios considerably. Gulf Oil Corp. recently announced the borrowing of 100 million dollars from an insurance company while Standard Oil Company (New Jersey) and Texas Company will probably need more funds for the development of oil properties in the Middle East.

Following are pertinent statistics and earnings data of the se-

Table IX

Balance Sheet Data

Item	Standard Oil Co. (New Jersey)	Gulf Oil Corp.	Mobilgas Petroleum	Texas Co.
Industry Rank of Company (based on 1948 Dependent-Asset Assets)	1	6	9	8
Gross Assets 12\31\45*	12,441.5	4,000.7	1495.8	1900.0
Net Depreciated Assets 12\31\45*	11,177.4	4 446.7	1232.7	1522.5
Percent Increase 1945-46:				
Gross Assets	34.5	70.1	100.0	71.4
Net Depreciated Assets	32.0	65.0	85.0	54.4
Book Value Per Share 12\31\45	41.40	300.00	124.25	240.00
Ratio Market Value to Book Value Per Share	100.82	104.00	116.44	102.00
Ratio Funded Debt and Preferred Stock to Total Capitalization 12\31\39	22.44	16.1	19.7	32.2
Ratio Funded Debt and Preferred Stock to Total Capitalization 12\31\45	32.4	10.3	12.4	34.0

*Millions
Percent as of 3\31\47

It will be noted that the market value of the stock is slightly higher than their respective book values. Standard Oil Company (New Jersey) is by far the largest company in the oil industry as may be seen by a comparison of the assets in the above table. Gulf Oil Company has reduced the ratio of funded debt to total capitalization since 1939, however in 1947 will undoubtedly raise these ratios considerably. Gulf Oil Corp. recently announced the borrowing of 300 million dollars from an insurance company while Standard Oil Company (New Jersey) and Texas Company will probably need more funds for the development of oil properties in the Middle East.

Following are pertinent statistics and economic data of the co-

lected companies:

Table X

Income Statement Data

Items	Standard Oil (New Jersey)	Gulf Oil Corp.	Phillips Petroleum	Texas Co.
Industry Rank of Company (based on 1945 Sales)	1	6	13	5
1945 Reported Earnings per Sh.	$ 5.64	$ 4.98	$ 4.59	$ 4.61
1945 Cash " " "	$10.68	$13.15	$15.50	$11.82
1945 Dividends per Share	$ 2.50	$ 2.00	$ 2.00	$ 2.00
Ratio Cash Earnings Retained	76.8%	84.8%	89.1%	83.1%
1945 Mean Price-reported earnings ratio	11.1-1	11.2-1	11.3-1	12.0-1
1945 Mean Price-cash earnings ratio	5.9-1	8.5-1	3.9-1	4.7-1
Percent Yield on 1945 Mean price	4.0%	4.3%	3.8%	3.6%
Percent Yield on 1946 Mean price	4.3%	3.7%	3.2%	4.2%
1941-45 Averages				
Stock Yield on Mean Price	4.76%	4.05%	4.70%	4.98%
Percent Cash Earnings Retained	73.4%	82.6%	81.3%	77.6%
Price-reported earnings Ratio	10.6-1	11.5-1	10.3-1	10.8-1
Price-cash Earnings Ratio	5.67-1	4.33-1	4.32-1	4.52-1

It will be noted that when cash earnings are considered instead of reported earnings, the ratio of earnings retained is quite large. This when correlated with growth of assets, production and the borrowing of new capital indicates the extent of the real growth of a company. It also shows the degree to which the earning power of the company, per share, has increased. A number of other companies which did not plow back a major portion of cash earnings into assets were unable to finance company growth out of earnings. This resulted in the necessity of borrowing additional capital or issuing more stock which meant di-

Radial compulsion:

Table I

Income Statement Data

Item	Standard Oil (New Jersey)	Gulf Oil Corp.	Phillips Petroleum Co.
Industry Rank of Company (Based on Sales Value)	1	2	10
1962 Reported Earnings per Share	$ 5.64	$ 4.25	$ 4.21
Item Cost	[illegible]	[illegible]	[illegible]
1962 Dividends per Share	$ 3.80	$ 2.00	$ 1.00
Ratio Cash Earnings Retained	[illegible]	[illegible]	[illegible]
1962 Cash Profit-Supported Earnings Ratio	11.1-1	11.8-1	11.6-1
1962 Cash Internally Earning Ratio	1.0-1	0.5-1	0.4-1
Forward Yield on 1962 Issue Price	[illegible]	[illegible]	[illegible]
Forward Yield on 1962 Issue Price	4.38	2.72	0.8
1961-62 Increase			
Cash Yield on Issue Price	6.72%	6.00%	6.70%
Internal Cash Earnings Retained	73.4%	82.2%	83.7%
Price-Supported Earning Ratio	12.4-1	17.4-1	20.4-1
Price-Cash Earnings Ratio	8.07-1	6.05-1	6.75-1

In this we notice that when cash earnings are considered instead of reported earnings, the ratio of earnings retained is quite large. This also corresponds with growth of assets, production and the increasing of the capital intensive the method of the post [illegible] of a company. We also show the degree to which the earning power of the company, per share, has increased. A number of other measures also are not quite basic to the position of each company into which can indicate to drawing company growth out of earnings. This results in the avoidance of increasing additional capital to develop more plan which would

lution of earning power per share of common stock.

Standard Oil Company in addition to its own operations, owns several large subsidiaries such as Humble Oil and Refining Company, Creole Petroleum Corp., Imperial Oil Company, Ltd., and Carter Oil Company. Their operations are reflected in the parent company's financial statements only as "Investments" and "Other Income". Thus, Standard Oil Company's cash earnings and ratio of cash earnings retained do not appear to be as large as those of the other three companies.

A good indication of growth in earning power, increase in dividends paid, as well as a comparison of the ratio of cash earnings retained, may be observed in the tabulation given below:

Table XI

Other Financial Data

Item	Standard Oil (New Jersey)	Gulf Oil Corp.	Phillips Petroleum	Texas Co.
1929-33 Aver. Cash Earnings per Share	$ 5.43	$ 3.77	$ 5.14	$ 5.28
1941-45 Aver. Cash Earnings per Share	$ 8.81	$ 9.93	$10.42	$ 9.99
Percent Increase	62.5%	164.0%	103.0%	89.0%
1929-33 Aver. Dividends per Share	$ 1.80	$ 0.45	$ 0.80	$ 2.04
1941-45 " " " "	$ 2.30	$ 1.70	$ 2.05	$ 2.20
Percent Increase	25.0%	278.0%	156.0%	7.9%
1929-33 Aver. Ratio Cash Earnings Retained	66.3%	88.5%	84.9%	61.4%
1941-45 Aver. Ratio Cash Earnings Retained	73.9%	82.8%	80.0%	78.0%
1929-45 Aver. Depreciation, Depletion Charges, etc*	$99.7	$57.5	$13.9	$40.6
1941-45 Aver. Depreciation, Depletion Charges, etc*	$109.2	$58.1	$24.9	$56.9
Percent Increase	9.8%	55.2%	79.0%	40.5%

*Millions

lution of burning power per shaft of [illegible] crude.

Standard Oil Company in addition to its own operations, also several large subsidiaries such as Cosmic Oil and National Company, Creole Petroleum Corp., Imperial Oil Company, Ltd., and various oil companies. Their operations are reflected in the parent company's financial statements only as "Interests" and "Other Income". Thus, standard Oil Company's cash earnings and profits of such subsidiaries reflected do not appear to be as large as those of the other three companies.

A good indication of growth in earning power, insofar as dividends paid, as well as a comparison of the ratio of cash earnings retained, may be observed in the tabulation given below:

Table II

Other Financial Data

Item	Standard Oil and Oil Utilities (New Jersey)	Cons.	Texas	Socony-Vacuum Corp.
1929-33 Aver. Cash Earnings per Share	$ 5.42	$ 5.77	$ 5.12	$ 2.04
1941-45 Aver. Cash Earnings per Share	$ 2.02	$ 2.05	$10.52	$ 2.02
Percent Increase	62.4%	146.0%	105.9%	50.0%
1929-33 Aver. Dividends per Share	$ 1.50	$ 0.42	$ 1.00	$ 1.04
1941-45 " " " "	$ 2.30	$ 1.70	$ 2.25	$ 2.30
Percent Increase	53.3%	304.8%	125.0%	121%
1929-33 Aver. Cash Earnings Retained	60.0%	92.8%	84.2%	49.0%
1941-45 Aver. Cash Earnings Retained	72.0%	32.2%	60.0%	47.0%
1929-33 Aver. Depreciation, Depletion Plus Charges, Also	$[illegible]	$[illegible]	$[illegible]	$[illegible]
1941-45 Aver. Depreciation, Depletion Plus Charges, Also	$[illegible]	$[illegible]	$[illegible]	$[illegible]
Percent Increase	9.8%	52.2%	72.8%	49.0%

Utilities

It will be seen that Gulf Oil Corp. has shown the greatest increase in earning power as well as percentage increase in dividends paid. Between 1922 and 1931 the controlling "Mellon" interests plowed a large part of the company's earnings back into the assets, thereby building the company into one of the largest factors in the petroleum industry. Dividends were omitted in the years 1932-35, even though cash earnings would have permitted such payments. As a result it appears that the increase in dividends paid by Gulf in the period 1941-45 is the greatest percentagewise over the years 1929-33, of any of the four companies.

Likewise, Phillips Petroleum Company passed its dividends between 1931-33 even though cash earnings would have allowed dividend payments. The earnings and dividends of Phillips show the second largest percentage increase. For years this company has pioneered in the production of natural gasoline and the development of natural gas reserves and commercial uses of natural gas. Today, its past efforts are bearing fruit. Although having domestic interests only, its operations are more diversified than the usual integrated oil company. It is the largest producer of natural gasoline and also sells natural gas and its by-products to industrial users at wider profit margins than are derived from the usual line of refined petroleum products. In 1948, it was the only one of the four companies selected which did not pay an extra dividend. Thus at its present price its stock sells for a lower yield than stocks of other companies. The company is trying to continue expansion of operations without resorting to new financing, thus retaining as large a portion of cash earnings as feasible.

It is interesting to note that while the earnings of Texas Com-

It will be seen that Gulf Oil Corp. has shown the greatest interest in earning power as well as production increases in Alkylate plant. Between 1953 and 1961 the nonrefining "Gulfine" subsidiary played a large part of the company's accounting that into the months, thereby building the company into one of the largest factors in the petroleum industry. Dividends were initiated in the years 1952-56, even though some earnings would have permitted such payments. As a result it appears that the increase in Alkylate plant up until it was running 1961-63 as the greatest petrochemicals over the years 1953-62, or any of the other companies.

Likewise, Gulfine Refineries company proved its existence was known 1951-62 even though such companies would have aligned with Alkylate models. The marketing and distribution of Gulfine were the second largest petrochemical increase. The years this company has pioneered in the production of natural gasoline and the development of medical use, research and commercial uses of natural gas. Today, its park efforts are barring fruits. Although having domestic industries only, the operations are more diversified than the usual integrated oil company. It is the largest producer of natural gasoline and also sells natural gas and its derivatives to industrial users at other profit margins than are derived from the usual line of refined petroleum products. In 1962, it was the only one of the four companies indicated that did not pay in water dividends. Time of the present price the stock sells for a lower yield than stock of other companies. The company is trying to combine combination of physicians without separating on the financial, thus indicating an lack of protection of such companies as investors.

It is interesting to note that while the earnings of these com-

pany for the 1941-45 period showed a large increase over the 1929-33 period, its increase in dividend payments was but 7.9%. However, compared to the other companies, Texas paid fairly liberal dividends during the depression years and retained a smaller portion of cash earnings during that period. Thus, Texas Company's dividend performance during the lean years of the "Early Thirties" was better than average.

The same may be said for the earnings and dividends of Standard Oil Company (New Jersey). Standard Oil seemingly retains less cash earnings and shows smaller increases in depletion, depreciation charges, etc. because the operating results of its subsidiaries show up in its income account only as "Other Income".

The following table shows a comparison of the basic operating statistics of the four companies:

Table XII

Operating Data

Item	Standard Oil (New Jersey)	Gulf Oil Corp.	Phillips Petroleum	Texas Co.
Crude Oil Reserves per Share*	163	495	105(1)	295
Market Value of Reserves per Share Divided by 20 Years**	$ 13.20	$ 40.09	$ 8.49	$ 23.90
Ratio to Mkt Value per Share	19.7%	65.80%	15.10%	40.40%
Ratio to Book Value per Share	22.5%	71.6%	17.65%	43.40%
Net Crude Production 1929***	280(2)	78,245	12,437	29,476(3)
" " " 1945***	980(2)	117,948	34,223	86,439
Percent Increase	250.0%	50.5%	176.0%	193.0%(3)
Refinery Runs 1929***	530(2)	77,894(4)	10,560(5)	58,504
Refinery Runs 1945***	1105(2)	106,615	28,092	123,661
Percent Increase	108.0%	37.0% (4)	166.0%	111.1%
Ratio Prod. to Ref. Runs 1929	52.8%	85.3%(4)	124.0%(5)	50.4%
" " " " " 1945	88.6%	110.4%	121.0%	69.8%

*Barrels

pany for the 1941-45 period showed a large increase over the 1930-32 period, the increase in dividend payments was not [illegible]. However, compared to the other companies, Texas paid fairly liberal dividends during the depression years and retained a smaller portion of each earnings during that period. Thus, Texas Company's dividend performance during the 1940 years of the "Early Thirties" was better than average.

The same may be said for the earnings and dividends of Standard Oil Company (New Jersey). Standard Oil generally retained less cash earnings and showed smaller increases in depletion, depreciation charges, but because the operating results of its subsidiaries show up in the income account only as "Other Income".

The following table shows a comparison of the basic operating statistics of the four companies:

Table XII

Operating Data

Item	Standard Oil (New Jersey)	Gulf Oil Corp.	Texas Company	Texas Co.
Crude Oil reserves per share*	1[illegible]	[illegible]	10[illegible]	[illegible]
Market Value of Reserves per Share divided by 30 Years*	$ 12.30	$ 40.00	$ 1.40	$ [illegible]
Ratio to Net Value per Share	19.7%	[illegible]	13.1%	[illegible]
Ratio to Book Value per Share	22.3%	71.0%	17.0%	[illegible]
Net Crude Production 1929***	100(1)	70,700	13,[illegible]	[illegible](7)
" " " 1942***	200(2)	117,[illegible]	[illegible]	[illegible]
Percent Increase	[illegible]	[illegible]	[illegible]	[illegible](8)
Refinery Runs 1929***	400(3)	77,[illegible](4)	10,000(6)	[illegible]
Refinery Runs 1942***	1100(2)	[illegible]	[illegible]	[illegible]
Percent Increase	[illegible]	[illegible](4)	[illegible]	[illegible]
Ratio Crud. to Ref. Runs 1929	[illegible]	[illegible](4)	[illegible](6)	[illegible]
" " " " " 1942	[illegible]	[illegible]	[illegible]	[illegible]

*Barrels

Table XII Cont'd

**Current price of $1.62 Per barrel of 36° Oklahoma Crude Oil
***Thousand of barrels
(1) Includes natural gasoline reserves
(2) Thousands of barrels per day
(3) 1931
(4) 1937
(5) 1932

Not included in Standard Oil Company's reserves are a proposed interest in the reserves held by Arabian-American Oil Company which possesses huge reserves in Saudi Arabia. Gulf Oil Corp.'s high number of barrels of crude oil reserves per share comes from its fifty percent interest in the very large oil reserves in the State of Kuwait in the Middle East. Although the reserves of Phillips Petroleum Company appear to be low relatively speaking, it must be remembered that it also has very sizeable natural gas reserves. It can be said that Phillips can earn its two dollar dividend from its natural gas business.

In respect to crude oil production, Gulf Oil Corp. has shown the smallest increase since 1929. However, it has just started to produce oil from its properties in Kuwait and in a few years will be producing much more oil from that area than it is currently. Likewise the crude production rates of Standard Oil Company and Texas Company will show large increased just as soon as a proposed pipeline from the Saudi Arabian oil fields to a Mediterranean port can be built and put into operation (1950). When this occurs the ratios of crude oil production to refinery thruputs of the latter companies will show further improvement.

All of these companies have been able to find large reserves and it is expected that their development in the coming years will

Saudi Oil Co.'s

*current price of $1.25 per barrel of 42 Gallons Crude oil
*thousand of barrels
(1) Includes natural gasoline reserves
(2) Thousands of barrels per day
(3) 1951
(4) 1957
(5) 1958

Not included in Standard Oil Company's reserves are a proposed interest in the reserves held by Arabian-American Oil Company which possesses huge reserves in Saudi Arabia. Gulf Oil Corp.'s high number of barrels of crude oil reserves per share comes from its 12½% interest in the very large oil reserves in the State of Kuwait in the Middle East. Although the reserves of Phillips Petroleum Company appear to be low relatively speaking, it must be remembered that it also has very sizable natural gas reserves. It can be said that Phillips has been 1st two dollar dividend from its natural gas business.

In respect to crude oil production, Gulf Oil Corp. has shown the greatest increase since 1950. However, if the just executed to produce oil from the properties in Kuwait and in the years will be producing much more oil from them than is is currently. Likewise the crude production rates of Standard Oil Company and Texas Company will show large increases just as soon as a proposed pipeline from the Saudi Arabian oil fields to a Mediterranean port can be built and put into operation (1960). When this occurs the ratios of crude oil production to refinery throughput of the latter companies will show further improvement.

All of these companies have been able to find large reserves and it is expected that their developments in the coming years will

greatly enhance the earning power of the common stock of each of these companies. It should be stated that Phillips Petroleum Company has informed this Country's State Department that it is interested in exploring for oil in the Middle East. Lands not yet explored are Yemen and neutral areas south and west of Kuwait and the possibility of these areas being explored in under consideration by our State Department. Already large in size and scope of operations, these companies show every prospect of becoming larger and more productive in the future.

Earnings of only Phillips Petroleum Company and The Texas Company for the 1946 calendar year have been reported at this writing. Reported earnings for Phillips Petroleum Company are $4.60 per common share which equals 1945 stated earnings of $4.59 a share. On a cash earnings basis, Phillips Petroleum Company showed $10.90 in 1946 as against $15.50 in 1945. The Texas Company's earnings showed an increase, reporting $6.32 a common share as against $4.61 in 1945. On a cash earnings basis Texas earned $11.50 in 1946 as against $11.82 in 1945.

While Gulf Oil Corp. and Standard Oil Company (New Jersey) have not at this writing made public their 1946 earnings figures, both companies are expected to report larger earnings than in 1945.

Because the average price of crude oil in one year has advanced from $1.20 to about $1.90 per barrel, an increase of 58%, and since current demand for petroleum products is greater than in 1946, it is believed that earnings of these oil companies will register even greater gains in 1947.

greatly reduces the earning power of the common stock of such if these companies. It should be stated that Utilities Securities Co. informed this Commission's staff officers that it is interested in acquiring for oil in the Middle East. Lands not yet explored are there and artificial areas north and west of Kuwait and the possibility of these areas being explored in major consideration by our Oil Department. Already large in size and scope of operations, these companies show every prospect of becoming larger and more productive in the future.

Earnings of only Utilities Securities Company and The Texas Company for the 1940 calendar year have been reported as follows: Reported earnings for Utilities Securities Company are $1.00 per common share which equals last stated earnings of $4.80 a share. On a cash earnings basis, Utilities Securities Company showed $10.06 in 1941 as against $11.00 in 1940. The Texas Company's earnings showed an increase, reporting $6.52 a common share as against $4.41 in 1941. On a cash earnings basis Texas earned $11.00 in 1942 as against $11.42 in 1941.

While Gulf Oil Corp. and Standard Oil Company (New Jersey) have not all this writing made public their 1941 earnings figures, both companies are expected to report larger earnings than in 1940.

Because the average price of crude oil in the year has averaged from $1.80 to about $1.90 per barrel, an increase of 30%, and since current demand for petroleum products is greater than in 1941, it is believed that earnings of these oil companies will undoubtedly show greater gains in 1947.

IV. Comparison of Selected Oil Stocks With Certain Common Stocks of Other Industries

In an effort to compare earnings growth of oil companies with other industrial companies the writer has selected other industrial common stocks, a few of which are currently considered cornerstone stocks for trust investment. It should be pointed out that the average of this list does not necessarily represent the average for all common stocks considered eligible for trust investment. However, by taking a few of the better quality stocks along with some possessing only average appeal the writer has attempted to give the list a little better than average representation. Thus, any favorable showing the selected oil stocks may make in the following tables of comparison indicates that the oil stocks are considerably better than average in that particular comparison.

The following tabulation shows a comparison of growth of earning power per share of oil stocks and selected industrial stocks between the two periods 1929-1933 and 1941-1945.

Table XIII

Growth in Cash Earnings Per Share

Company	Average 1929-33	Average 1941-45	Percent Increase
Selected Oil Stocks			
Standard Oil Co. (New Jersey)	$5.43	$8.81	62.5%
Gulf Oil Corp.	3.77	9.93	164.0
Phillips Petroleum Co.	5.14	10.42	103.0
Texas Company	5.28	9.99	89.0
Arithmetic Average	$4.91	$9.78	99.5%
Other Industrial Stocks			
E. I. dePont de Nemours & Co.	$5.03	$9.27	84.0%
Eastman Kodak Co.	8.27	14.40	74.0
General Electric Co.	1.41	2.72	93.0

IV. Comparison of Selected Oil Stocks with Certain Common Stocks of Other Industries

In an effort to compare earnings growth of oil companies with other industrial companies the writer has selected other industrial common stocks, a few of which are currently considered conservative stocks for trust investment. It should be pointed out that the average of this list does not necessarily represent the average for all common stocks considered eligible for trust investment. However, by taking a few of the better quality stocks along with some possessing only average appeal the writer has attempted to give the list a little better than average representation. Then, any favorable showing the selected oil stocks may make in the following tables of comparison indicates that the oil stocks are considerably better than average in that particular comparison.

The following tabulations show a comparison of growth of earning power per share of oil stocks and selected industrial stocks between the two periods 1930-1937 and 1941-1948.

Table XIII

Growth in Cash Earnings Per Share

Company	Average 1930-37	Average 1941-48	Percent Increase
Selected Oil Stocks			
Standard Oil Co. (New Jersey)	[illegible]	[illegible]	[illegible]
Gulf Oil Corp.	[illegible]	[illegible]	[illegible]
Phillips Petroleum Co.	[illegible]	[illegible]	[illegible]
Texas Company	[illegible]	[illegible]	[illegible]
Arithmetic average	[illegible]	[illegible]	[illegible]
Other Industrial Stocks			
E. I. duPont de Nemours & Co.	[illegible]	[illegible]	[illegible]
Eastman Kodak Co.	[illegible]	[illegible]	[illegible]
General Electric Co.	[illegible]	[illegible]	[illegible]

Table XIII Cont'd

Growth in Cash Earnings Per Share

Company	Average 1929-33	Average 1941-45	Percent Increase
Other Industrial Stocks Cont'd			
General Motors Corp.	$3.33	$5.19	56.0%
International Business Mach. Corp.	6.06	14.80	144.0
National Steel Corp.	4.14	11.82	186.0
J. C. Penney Co.	1.45	2.64	82.0
Sears Roebuck & Co.	0.94	1.91	103.0
Arithmetic Average	$3.83	$7.84	105.0%

It will be seen that the mean percentage increase in earning power per share for the oil stocks is slightly less than for the group of industrial stocks, although the average for the four oil companies is better than the growth recorded by five of the eight industrial stocks.

It has already been noted that oil companies retain a relatively large portion of cash earnings for expansion purposes. This is quite apparent when compared with other industrial stocks. In the following table it will be seen that the selected industrial stocks retained an average of 47.3% of cash earnings as against 77.7% for the oil companies:

Table XIV

Average Earnings and Dividends Per Share 1929-1945

Company	Cash Earnings	Dividends	% Cash Earnings Retained
Selected Oil Stocks			
Standard Oil Co. (New Jersey)	$7.27	$1.89	74.0%
Gulf Oil Corp.	6.45	0.93	85.6
Phillips Petroleum Co.	7.43	1.57	87.6
Texas Company	7.32	1.94	73.5
Arithmetic Average	$7.12	$1.58	77.7%
Other Industrial Stocks			
E. I. duPont de Nemours & Co.	$3.94	$5.20	32.0
Eastman Kodak Co.	11.16	6.04	45.8

Table XIII Concld.

Growth in Cash Earnings for Years

Company	Average Profit 1920-29	Average Profit 1931-40	Percent Increase
Other Industrial Stocks Traded			
General Electric Co.	84.23	78.15	10.02
Independent Business Mach. Corp.	6.05	13.30	114.0
Sullivan Steel Corp.	4.44	11.88	160.0
G. C. Murphy Co.	11.40	8.64	(23.0)
Rexall Drugs, Inc.	0.94	1.01	7.0
Arithmetic Average	27.25	27.00	(0.9)

It will be seen that the oil stocks in aggregate had more for the group of industrial stocks, although the average for the oil companies is higher than the growth experienced by the industrial group.

It has already been noted that oil companies retain a relatively large portion of cash earnings for expansion purposes. This is quite apparent when compared with other industrial concerns. In the following table it will be seen that the selected industrial stocks retained an average of 47.5% of cash earnings as against 77.9% for the oil companies.

Table XIV

Average Earnings and Dividends for Years 1920-1940

Company	Cash Earnings	Dividends	% Cash Earn. Div. Retained
Selected Oil Stocks			
Atlantic Ref. Co. (Pan American)	27.37	23.02	74.0%
Gulf Oil Corp.	6.48	0.47	92.0
Phillips Petroleum Co.	4.44	1.07	87.0
Texas Company	7.23	1.84	75.5
Arithmetic Average	47.52	21.02	77.9%
Other Industrial Stocks			
E. I. duPont de Nemours & Co.	24.04	14.60	39.0
Eastman Kodak Co.	11.24	6.04	46.0

Table XIV Cont'd

Average Earnings and Dividends Per Share 1929-1945

Company	Cash Earnings	Dividends	% Cash Earnings Retained
Other Industrial Stocks Cont'd			
General Electric Co.	$ 1.94	$1.30	32.8%
General Motors Corp.	4.43	2.74	38.2
International Business Mach.	9.77	3.43	64.8
National Steel Corp.	7.92	2.06	74.0
J. C. Penney Co.	2.00	1.44	28.0
Sears Roebuck & Co.	1.63	0.80	50.7
Arithmetic Average	$ 5.47	$2.88	47.3%

In some respects, this large percentage retention of cash earnings measures future growth possibilities in earning power of the oil stocks as against the group of industrial stocks.

Surprisingly enough, in spite of the fact that oil stocks possess better than average growth factors, the average yield for such oil stocks is currently better than that for the group of industrial stocks. This may be seen by comparing the arithmetic averages in the following table:

Table XV

Comparative Stock Yields

Company	Market 2/21/47	Current Divd Rate	Current Yield	Average 1929-45 Divd Rate	Yield on 2/21/47 Market
Selected Oil Stocks					
Standard Oil Co. (N.J.)	66 7/8	$3.08	4.62%	$1.89	2.83%
Gulf Oil Corp.	60 3/4	2.50	4.12	0.93	1.53
Phillips Petroleum Co.	56 1/4	2.00	3.56	1.57	2.79
Texas Company	59 1/4	2.50	4.22	1.94	3.28
Arithmetic Average	60 3/4	$2.50	4.12%	$1.58	2.60%
Other Industrial Stocks					
E. I. deFont de Nemours	191	$7.00	3.67%	$4.82	2.52%
Eastman Kodak Co.	231	6.00	2.60	6.04	2.61

Table XIV (cont'd)

Average Earnings and Dividends for Some 1929-1941

Company	Gross Earnings	Dividends	% Earn. Gross Div. Returned
Other Industrial Stocks (cont'd)			
General Electric Co.	$ 1.04	11.00	06.0%
General Motors Corp.	4.48	2.74	55.5
International Business Mach.	5.77	3.42	54.0
National Steel Corp.	7.22	3.00	74.0
U. S. Steel Co.	2.00	1.04	52.0
Sears Roebuck & Co.	1.82	0.60	80.7
Arithmetic Average	$ 4.47	[illegible]	[illegible]

In some respects, this large percentage reduction of well managed measures future growth possibilities in earning power of the oil stocks as against the group of industrial stocks.

Surprisingly enough, in spite of the fact that oil stocks possess better than average growth features, the average yield for such oil stocks is correspondingly better than that for the group of industrial stocks. This may be seen by comparing the arithmetic averages in the following table.

Table XV

Comparative Stock Yields

Company	Forward E/P/A/	Current Div. Rate	Current Yield	Change 1940-43 E/P/A/	Yield on Market
Industrial Oil Stocks					
Standard Oil Co. (N.J.)	00 %	12.00	4.00%	77.00	5.00%
Gulf Oil Corp.	00 %	3.00	4.17	0.85	1.85
Phillips Petroleum Co.	00 %	4.00	3.00	1.87	2.77
Texas Company	00 %	2.00	4.85	1.06	2.24
Arithmetic Average	00 %	[illegible]	4.18%	[illegible]	[illegible]
Other Industrial Stocks					
E. I. DuPont de Nemours Co.		17.00	3.00%	24.00	1.42%
Eastman Kodak Co.	2%	5.00	2.00	4.04	3.21

Table XV Cont'd

Comparative Stock Yields

Company	Market 2/21/47	Current Divd Rate	Current Yield	Average 1929-45 Divd Rate	Yield on 2/21/47 Market
Other Industrial Stocks Cont'd					
General Electric Co.	38 3/8	$1.60	4.18%	$1.30	3.39%
General Motors Corp.	62 1/2	3.00	4.81	2.74	4.38
Int'l Business Mach.	217 1/2	6.00	2.76	3.43	1.58
National Steel Corp.	90	4.00	4.44	2.06	2.29
J. C. Penney Co.	45 1/2	2.00	4.40	1.44	3.16
Sears Roebuck & Co.	38	1.00	2.63	0.80	2.11
Arithmetic Average	114 1/4	$3.70	3.24%	$2.83	2.39%

Likewise the average yield based on the mean dividend paid between the years 1929 and 1945 favors the oil stock group. Thus, historically speaking and based upon current market prices, the selected oil stock group gives a more liberal yield, in spite of the retention of a larger portion of cash earnings.

In point of view of market performance as compared with 1929-1933 price ranges, the following statistical comparison shows that the oil stock group has declined less from its 1929 high average than has the industrial stock group:

Table XVI

Market Performance

Company	Mkt Range 1929-33	Market 2/21/47	% Decrease from '29 High	% Increase from 1932-33 Low
Selected Oil Stocks				
Standard Oil Co. (N.J.)	83-20	66 7/8	-19.5%	235.0%
Gulf Oil Corp.	105-12	60 3/4	-42.1	407.0
Phillips Petroleum	47-2	56 1/4	+19.8	2718.0
Texas Company	72-9	59 1/4	-17.6	558.0
Arithmetic Aver.	76 3/4-10 3/4	60 3/4	-20.8%	878.0%

Table XV Concld'd

Comparative Stock Yields

Company	Market 1/31/37	Earnings Last Yr	Dividends Last Yr	Yield on 1/31/37 Mkt. Price
Other Industrial Stocks Concld'd				
General Electric Co.	50 3/8	$1.00	$4.10%	12.0%
General Foods Corp.	62 1/2	7.00	4.85	5.75
Int'l Business Mach.	227 1/2	6.00	5.75	2.53
National Steel Corp.	50	6.00	4.44	8.88
J. C. Penney Co.	46 1/2	7.00	6.00	1.44
Sears Roebuck & Co.	50	1.50	2.25	0.50
Arithmetic Average	114 1/2	$6.70	$7.52	$2.75

Likewise the average yield based on the mean liquidated yield between the years 1929 and 1942 favors the oil stock group. Thus, statistically speaking and based upon current market prices, the selected oil stock group gives a more liberal yield, in spite of the retention of a larger portion of back earnings.

In point of view of future performance as compared with 1929-1933 price ranges, the following statistical comparison shows that the oil stock group has declined less from the 1929 high prices than the industrial stock group:

Table XVI

Market Performance

Company	1929-33 Market Price	% Decrease from '29 High	% Increase from 1933-37 Low
Selected Oil Stocks			
Standard Oil Co. (N.J.)	49-30	60 1/2	-15.8%
Gulf Oil Corp.	102-12	60 1/2	-82.1
Phillips Petroleum	47-2	22 1/2	+12.2
Texas Company	73-3	22 1/2	-17.0
Arithmetic Aver.	72 3/4-10 3/4	60 1/2	-18.6%

Table XVI Cont'd

Market Performance

Company	Ext Range 1929-33	Market 2/21/47	% Decrease from '29 High	% Increase from 1932-33 Low
Other Industrial Stocks				
E. I. duPont de Nemours	230-22	191	-16.9%	767.0%
Eastman Kodak Co.	265-35	231	-12.7	561.0
General Electric Co.	100-8	38 3/8	-61.2	379.0
General Motors Corp.	92-8	62 1/2	-32.1	681.0
Int'l Business Mach.	108-26	217 1/2	+101.0	637.0
National Steel Corp.	60-14	90	+50.0	542.0
J. C. Penney Co.	35-4	45 1/2	+30.0	1038.0
Sears Roebuck & Co.	43-2	38	-15.6	1800.0
Arithmetic Aver.	117-16 1/8	67 3/4	-42.1%	707.0%
Dow-Jones Industrial Average	381.17-41.22	182.26	-52.2%	343.0%

Also, the oil stock group has recovered to a greater extent from the 1932-33 low average than have the industrial stocks. It is interesting to observe that both groups have performed better marketwise than has the Dow-Jones Industrial Average.

Summarizing, it may be said that the increase in earning power of the oil stocks has just about kept pace with the average for the selected industrial stocks, that the oil companies retain a larger portion of cash earnings, but that in spite of this, the oil stock group currently and historically sells at a better yield and has shown better market performance since 1929.

Table VII (cont'd)

Income Performance

Company	Net Income Variance 1929-32	% Decrease	% Increase
Other Industrial Stocks			
4. Ac Spark Pl Co Common	181	-12.4%	187.4%
Burroughs Adding Mch.	184-30	181	-22.7	181.0
General Electric Co.	108-4	80	-42.4	17.0
General Motors Corp.	98-0	62	-32.1	84.1
Int'l Business Mach.	108-30	217	+101.2	47.0
National Steel Corp.	46-14	80	+73.8	14.0
J. C. Penney Co.	16-4	49	+80.0	206.0
Sears Roebuck & Co.	42-4	38	-7.9	140.0
Aggregate Var.	1174-12	47	-96.1	70.4%
Non-Income Industrial Average	221.17-41.62	124.24	-42.4%	38.0%

Also, the oil stock group has recovered to a greater extent from the 1929-32 low average than have the industrial stocks. It is interesting to observe that most groups have performed better during recovery than has the non-income industrial average.

Summarizing, it may be said that the increase in earning power of the oil stocks has just about kept pace with the average for the general industrial stocks, but the oil companies retain a larger portion of each earnings, one that is quite at risk, the oil stock group generally and distinctively sells at a better yield and has shown better market performance since 1929.

V. Conclusion

Selected oil company stocks appear to meet all the requirements of a common stock suitable for trust investment. While the market performance of oil stocks is similar to that of other industrial common stocks, their range of movement is not as great in most instances, due to sustained demand for petroleum products in depression years.

While dividends are relatively small in relation to cash earnings, such a policy tends to preserve and enhance the future earning power of the stock. On a current yield basis, oil stocks sell at a yield comparable with other common stocks considered eligible for trust investment.

The petroleum industry is very large, indispensable to both our domestic and world economies and shows every indication of continued vigorous growth. While certain oil companies have become major units in the industry and at the present time are more favorably situated to show better performance in the future, nevertheless, constant review and analysis of these companies is as necessary as it is with any other company whose common stock qualifies for trust investment.

V. Conclusion

Diluted oil analogy appears appear to meet all the requirements of a common stock suitable for trust investment. While the actual performance of oil stocks is similar to that of other industrial common stocks, their image of economic is not is great as that investment, but to overcome demand for petroleum products in depression years.

While dividends are relatively small in relation to market earnings, much of policy tends to preserve and enhance the income earning power of the stocks. In a cyclical field tends, oil shares will at a yield comparable with other common stocks considered suitable for trust investment.

The petroleum industry is very large, integrated in both domestic and world economies and alone study interaction of economic and political phenomena. While certain oil companies have been engaged in the industry and as the present time are more favorably situated to know better performance in the future, nevertheless, continued review and analysis of these companies is as necessary as it is with any other company whose common stock qualifies for trust investment.

APPENDIX A

Table I.

Production of Crude Oil by Selected States, 1935-1946

(in Thousands of Barrels)

Year	Texas	California	Oklahoma	Louisiana	Kansas*
1935	392,666	207,832	185,228	50,330	54,843
1936	427,411	214,773	206,555	80,491	58,317
1937	510,318	238,521	228,839	90,924	70,761
1938	475,850	249,749	174,994	95,208	60,064
1939	483,528	224,354	159,913	93,646	60,703
1940	493,209	223,881	156,164	103,584	66,139
1941	505,572	230,263	154,702	115,908	85,171
1942	483,097	243,326	140,690	115,785	98,996
1943	594,343	284,188	123,152	123,592	106,839
1944	748,122	311,793	124,616	129,207	99,227
1945	756,533	326,482	138,036	130,566	99,359
1946	764,593	316,606	137,228	151,608	99,579

*Includes Nebraska and Missouri after 1938

Source: Deegan, C. J., "Peacetime Production Exceeds That at Peak of War", The Oil and Gas Journal, Vol. 45, No. 38, 1947

APPENDIX A

Table 1.

Production of Crude Oil by Selected States, 1926-1964

(In Thousands of Barrels)

Year	Texas	California	Illinois	Louisiana	Kansas
1925	452,066	207,032	121,290	70,330	84,063
1926	427,411	214,773	109,083	70,344	88,417
1927	510,319	230,821	116,078	80,934	72,761
1928	476,030	148,748	117,294	84,209	68,094
1929	483,049	144,534	133,913	87,552	80,703
1930	405,200	213,881	136,164	102,784	84,134
1931	305,872	230,245	164,772	112,724	85,171
1932	405,027	244,456	140,880	111,738	84,[illegible]
1933	494,415	284,140	133,182	123,202	132,080
1934	740,132	311,738	174,045	132,307	8[illegible],327
1935	728,323	322,462	132,364	130,608	99,829
1940	724,332	316,408	127,124	101,924	84,374

*Including Condensate and Natural Gas

Source: Dodge, D. G., "Producing Production Accounts Just as Good as Gas of Oil", The Oil and Gas Journal, Vol. 46, No. 40, 1947

APPENDIX A

Table II

Estimated Proved Crude Petroleum Reserves in the United States, 1936-46

(in Millions of Barrels)

Year or Period	Estimated Proved Reserves at Beginning of Period	Addition to Estimated Reserves: Through Discovery of New Pools	Through Revisions and Extensions of Known Fields	Total	Production	Net Addition to Proved Reserves
1935(1)	12,177	1,477	1,455	2,932	2,046	886
1936	--					
1937	13,063	929	2,793	3,722	1,278	2,444
1938	15,507	810	2,244	3,054	1,213	1,841
1939	17,348	341	2,058	2,399	1,264	1,135
Total '35-'39	12,177	3,557	8,550	12,107	5,801	6,306
1940	18,483	286	1,607	1,893	1,351	542
1941	19,025	430	1,539	1,969	1,405	564
1942	19,589	260	1,619	1,879	1,385	494
1943	20,083	282	1,202	1,484	1,503	-19
1944	20,064	511	1,556	2,067	1,678	389
1945	20,453	420	1,690	2,110	1,736	374
Total '40-'45	18,483	2,189	9,213	11,402	9,056	2,344
1946	21,078	147	1,869	2,016	1,749	267
Total '35-'46	12,177	5,893	19,632	25,525	16,608	8,917
Annual Average:						
1935-1939	--	711	1,710	2,421	1,160	1,261
1940-1945	--	365	1,535	1,900	1,509	391
1935-1946	--	522	1,615	2,137	1,351	786

(1) No estimate was made at the end of 1935.

Source: Bell, D., Simpson, K., Mikol, V., "Petroleum", United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1946; 1946 Figures, Deegan, C. J., "Proven Reserves Increase Despite Record Output", The Oil and Gas Journal, Vol. 45, No. 38, 1947

APPENDIX A

Table II

Estimated proved crude petroleum reserves in the United States, 1926-40

(In millions of barrels)

Year or period	Estimated proved reserves as beginning of period	Additions to estimated reserves: Discovery of new fields	Through extensions and revisions of known fields	Total	Production	Net additions to proved reserves
1926(1)	12,177	1,477	1,465	2,942	1,040	902
1926	--					
1927	13,004	958	1,778	3,728	1,774	2,954
1928	15,007	820	2,844	3,674	1,913	1,761
1929	17,680	941	2,088	3,029	1,904	1,125
Total '26-'29	12,177	3,197	8,180	12,427	6,601	5,826
1930	15,456	805	1,027	1,832	1,201	642
1931	15,018	450	1,050	1,500	1,008	492
1932	15,860	300	1,619	1,919	1,392	527
1933	16,025	240	1,028	1,268	1,207	61
1934	16,086	211	1,480	1,691	1,074	617
1935	16,653	430	1,800	2,230	1,976	254
Total '30-'35	12,177	2,436	6,754	9,190	6,857	2,333
1936	18,610	1,427	1,868	3,295	1,748	1,547
Total '26-'36	12,177	8,100	16,802	24,902	16,000	8,902
Annual average:						
1926-1929	--	711	2,710	3,421	1,190	1,231
1930-1935	--	358	1,126	1,484	1,143	341
1936-1940	--	225	1,018	1,243	1,207	036

(1) No estimate was made at the end of 1926.

Source: Hall, G., Stigrove, E., Kinch, V., "Petroleum", Annual Finance Survey Commission, Published by United States Government Printing Office, Washington, D. C., 1940; 1940 Figures, Ibidem. J. L., "Report to Reserve Industrial Security Board", The Oil and Gas Journal, Vol. 46, No. 30, 1947

APPENDIX A

Table III.

Estimated World Crude Petroleum Reserves, Known or Definitely Indicated, by Continents and Countries, 1945.

Continent and Country	Quantity*	Percent of Total
North America:		
Canada	150	.2%
Cuba	1	-
Mexico	600	1.0
United States	20,453	32.0
Total, North America	21,204	33.2
South America:		
Argentina	260	.4
Bolivia	45	.1
Brazil	1	-
Colombia	505	.8
Ecuador	45	.1
Peru	135	.2
Trinidad	239	.4
Venezuela	7,000	10.9
Total, South America	8,230	12.9
Europe:		
Albania	41	.1
Austria	38	.1
Czechoslovakia	1	-
England	3	-
France	11	-
Germany	30	-
Hungary	75	.1
Italy	1	-
Poland	30	-
Romania	392	.7
Soviet Union	5735	9.0
Yugoslavia	10	-
Total, Europe	6,367	10.0

APPENDIX A

Table III.

Nationals could Cross Frontiers Between, Some or Definitely Indicated, by Continents and Countries, 1944.

Continents and Country	Quantity	Percent of Total
North America:		
Canada	180	[illegible]
Cuba	1	-
Mexico	800	1.0
United States	80,182	[illegible]
Total, North America	81,163	[illegible]
South America:		
Argentina	200	[illegible]
Bolivia	10	[illegible]
Brazil	1	-
Colombia	104	[illegible]
Ecuador	48	[illegible]
Peru	150	[illegible]
Trinidad	250	[illegible]
Venezuela	8,000	[illegible]
Total, South America	8,763	[illegible]
Europe:		
Albania	41	[illegible]
Austria	10	[illegible]
Czechoslovakia	1	-
England	3	-
France	11	-
Germany	30	-
Hungary	72	[illegible]
Italy	1	-
Poland	30	-
Russia	809	[illegible]
Soviet Union	6786	[illegible]
Yugoslavia	10	-
Total, Europe	8,393	[illegible]

APPENDIX A

Table III Cont'd

Estimated World Crude Petroleum Reserves, Known or Definitely Indicated, by Continents and Countries, 1945

Continent and Country	Quantity*	Percent of Total
Asia and Africa:		
Burma and India	167	.3%
China	2	-
Egypt	86	.1
Iran	6,500	10.2
Iraq	5,000	7.8
Japan	36	-
Kuwait	9,000	14.1
Netherlands Indies and Borneo	950	1.5
Qatar	1,000	1.6
Sakhalin	30	-
Saudi Arabia and Bahrein Island	5,300	8.3
Total, Asia and Africa	28,071	43.9
Total, World	63,872	100.0%

*in Millions of Barrels

Source: Bell, D., Simpson, K., Mikol, V., "Petroleum", United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1946

APPENDIX A

Table III: Part 1A

Estimated Total Crude Petroleum Reserves, Items or Individually Listed, by Continents and Countries, 1962

Continent and Country	Quantity	Percent of Total
Asia and Africa:		
Burma and India	187	.2%
China	8	-
Egypt	35	.4
Iran	8,000	10.2
Iraq	5,000	6.4
Japan	24	-
Kuwait	9,000	14.1
Netherlands Indies and Borneo	980	1.2
Qatar	1,000	1.2
Sakhalin	30	-
Saudi Arabia and Neutral Island	2,000	2.5
Total, Asia and Africa	27,011	33.8
Total, World	80,000	100.00%

Sources: Nell, G., Simpson, E., Stout, T., "Petroleum", United Nations Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1962

APPENDIX

Table IV

Prewar, Early Postwar and Long-term Forecast of Trend of Petroleum Requirements in the United States

(Figures in Thousands Barrels per day unless Otherwise Stated)

	Prewar		Early Postwar				Long Term		
	1939	1941	1947	1948	1949	1950	51-55	56-60	61-65
Motor Fuel (gasoline)									
Passenger cars	983	1146	1045	1210	1315	1360	1440	1550	1635
Aviation	10	30	125	100	85	100	125	175	200
All other uses	559	653	700	730	750	760	725	775	825
Total	1522	1829	1870	2040	2150	2220	2290	2500	2660
Kerosene	168	190	202	206	211	215	215	225	230
Distillate Fuel Oils:									
Home-heating fuel	265	341	402	448	488	510	538	555	565
Diesel fuels & all others	105	133	198	195	197	214	240	260	280
Total	370	474	600	643	685	724	778	815	845
Lubricants:									
Automotive	34	39	41	43	45	46	48	51	53
Industrial	31	44	44	46	46	46	49	54	57
Total	65	83	85	89	91	92	97	105	110
All Other Products & Losses	355	440	513	534	551	562	570	610	650
Total all petroleum prod.	3373	4071	4395	4650	4835	4988	5110	5455	5735
Memoranda:									
Aver. No. Pass. Cars in use*	25036	27382	25800	28000	30000	31500	34000	37500	40000
Consumption Per Car, bbls. per year	13.9	15.3	14.8	15.7	16.0	15.8	15.4	15.1	14.9
Aver. No. Oil Burners in use*	1749	2243	2850	3175	3475	3750	4000	4400	4800
Consumption Per Burner, bbls. per year	57.8	56.8	51.5	51.4	51.2	49.5	49.0	46.0	43.0
Federal Reserve Board Index of production	108	162	161	172	175	170	175	188	200

*000 omitted

Source: Wilson, R. E., "Total Demand for All Petroleum Products", Petroleum Requirements-Postwar, Published by United States Government Printing Office, Washington, D. C., 1946

APPENDIX A

Table IV

Power, Early Postwar and Long-Term Forecasts of Trend of Petroleum Requirements in the United States

(Figures in Thousands Barrels per Day unless Otherwise Stated)

	Power		Early Postwar			Long Term		
	1939	1941	1947	1948	1949	1960	1965-69	1974-80
Motor fuel (gasoline)								
Passenger cars	998	1140	1046	1219	1319	1400	1520	1615
Aviation	10	30	139	200	40	100	185	170	800
All other uses	889	888	700	750	700	700	715	775	800
Total	1897	1958	1885	2169	2059	2200	2420	2560	2600
Kerosene	140	100	394	306	211	125	117	104	100
Distillate fuel oils:									
Home-heating fuel	286	341	402	368	424	410	400	380	380
Diesel fuels & all others	105	173	178	170	197	172	200	200	200
Total	370	474	580	538	622	572	572	512	500
Lubricants:									
Automotive	34	50	41	45	43	46	47	51	55
Industrial	31	44	44	46	46	46	50	54	57
Total	65	93	85	91	89	92	97	105	110
All other products & losses	390	440	412	394	401	386	370	410	450
Total all petroleum prod.	2872	3071	3395	3500	3810	4000	4210	4500	4700
Memoranda:									
Aver. No. Haz. Gas. Gare Ju use*	23024	27428	32500	36000	40000	51500	54000	57500	61000
Consumption for Car, bbls. per year	13.8	14.3	14.5	15.7	16.0	16.4	16.4	16.1	16.9
Aver. No. Oil Burners in use*	1724	2242	2500	3276	3475	4750	4800	4800	4800
Consumption for Burner, bbls. per year	57.6	56.8	61.6	61.1	61.1	63.4	63.0	63.0	63.0
Federal Reserve Board Index of production	108	109	161	170	174	170	175	190	200

*000 omitted

Source: Gilman, R. E., "Total Demand for All Petroleum Products", Petroleum Requirements-Postwar, Published by United States Government Printing Office, Washington, D. C., 1946

APPENDIX B

Groups of Oil Companies Operating in The Middle East

These Four Groups Are:

In Iran - Anglo-Iranian Oil Co., Ltd.

In Iraq and Qatar - Anglo-Iranian, Dutch-Shell, Socony-Vacuum Oil, Standard Oil Company (New Jersey) and a French Government Company.

In Kuwait - Anglo-Iranian and Gulf Oil Corporation

In Saudi Arabia and Bahrein Island - Standard Oil Company of California and Texas Company

Source: Bell, D., Simpson, K., Mikol, V., "Petroleum", P. 103, United States Tariff Commission, Published by United States Government Printing Office, Washington, D. C., 1946

APPENDIX I

Groups of Oil Companies Operating in the Middle East

These four groups are:

In Iran - Anglo-Iranian Oil Co., Ltd.

In Iraq and Qatar - Anglo-Iranian, Netherlands-Oil, Compagnie-Française Standard Oil Company (New Jersey) and a French Government Company.

In Kuwait - Anglo-Iranian and Gulf Oil Corporation

In Saudi Arabia and Bahrein Island - Standard Oil Company of California-Texas and Texas Company

Source: Lenczowski, G., Oil and State in the Middle East, Cornell University Press, Ithaca, New York, 1960, p. 100.

APPENDIX B

"Legal List Rule" versus "Prudent Man Rule"

State laws governing the investment powers of trustees are very dissimilar. In New York State, trustees operate under what is termed the "Legal List Rule". In the absence of express authority they may not invest in any types of common or preferred stocks. The New York law limits investments by trustees with few exceptions to securities legal for investment by savings banks. (1)

The "Massachusetts Rule", more commonly referred to as the "Prudent-Man Rule for Trust Investment", had its origin in a case decided in 1830 by the Supreme Judicial Court of the Commonwealth of Massachusetts. In the decision of Harvard College v. Amory, (2) Justice Putnam included the sum and substance of the "Massachusetts Rule".

> "All that can be required of a trustee to invest, is, that he shall conduct himself faithfully and exercise a sound discretion. He is to observe how men of prudence, discretion and intelligence manage their own affairs, not in regard to speculation, but in regard to the permanent disposition of their funds, considering the probable income, as well as the probable safety of the capital to be invested."

During the intervening 116 years, there have been few cases adjudicated by the Supreme Judical Court which have further restricted the availability of investment securities to a trustee operating under the Prudent Man Rule. (3)

(1) Jordan, D. F., "Investments", P. 213, Prentice Hall, Inc., New York City, 1941
(2) Harvard College v. Amory, 9 Pickering 446, P. 461
(3) Wren, P. I., The Massachusetts Rule of Investment and The Corporate Trustee, Graduate School of Banking, conducted by The American Bankers Association at Rutgers University, New Brunswick, New Jersey, June 1944, P. 8. (Thesis)

APPENDIX I

"Legal List Rule" versus "Prudent Man Rule"

Trust Law governing the investment powers of fiduciaries are very diversified. In New York State, trustees operate under what is termed the "Legal List Rule". In the absence of express authority they may not invest in any type of common or preferred stocks. In New York law fiduciaries investments by trustees with the exception of securities legal for investment by savings banks. (1)

The "Massachusetts Rule", more commonly referred to as the "Prudent-Man Rule for Trust Investment", had its origin in a case decided in 1830 by the Supreme Judicial Court of the Commonwealth of Massachusetts. In the decision of Harvard College v. Amory, (2) Justice Putnam included the use and substance of the "Massachusetts Rule".

> "All that can be required of a trustee to insure, is, that he shall conduct himself faithfully and exercise a sound discretion. He is to observe how men of prudence, discretion and intelligence manage their own affairs, not in regard to speculation, but in regard to the permanent disposition of their funds, considering the probable income, as well as the probable safety of the capital to be invested."

During the intervening 116 years, there have been the cases adjudicated by the Supreme Judicial Court which have further restricted the availability of investment securities in a trustee operating under the Prudent Man Rule. (3)

(1) Jordan, J. F., "Investments", p. 118, Prentice Hall, Inc., New York City, 1941

(2) Harvard College v. Amory, 9 Pickering 446, p. 461

(3) Kerr, F. L., The Massachusetts Rule of Investment and the Corporate Trustee, Graduate School of Banking, conducted by the American Institute of Banking at Rutgers University, New Brunswick, New Jersey, June 1944, p. 8. (Thesis)

APPENDIX B Cont'd

A list of "don'ts" for trustees operating under the Massachusetts Rule are as follows: (1)

"1. Purchase securities at a discount (for that indicates there is common doubt as to the safety of principal or the continuing reasonableness of the yield).

2. Make investments for the short haul (this is not the permanent disposition of one's funds).

3. Buy unseasoned securities.

4. Invest in a business directly.

5. Engage in self-dealing.

6. Purchase junior liens.

7. Acquire foreign real estate.

8. Invest in unproductive property (e.g., real estate held for a rise in value).

9. Loan money on personal notes without security.

10. Invest in wasting assets."

A careful study of the Harvard College v. Amory decision and the list of "don'ts" of Mayo Shattuck reveals the type of securities available for a trustee operating under the Prudent-Man Rule.

It should be noted that the New York or Legal List Rule, does not allow trustees to invest in equities of companies while the Prudent Man Rule does permit trustees to invest in common stocks. This comprises the main difference between the two rules. One is rigid while the other is flexible and can cope with the changing conditions. Over

(1) Shattuck, M., "The Massachusetts Rule", Trusts and Estates, P. 212, 1942

A list of "duties" for Iranian workers under the Iranian-

ports bills and an Italian: (1)

"1. Business consultation at a discount (for duty in-
dividual there is common doubt as to the safety
of principal or the surrounding circumstances
of the yield).

2. Take investments for the short haul (this is
not the permanent alignmentin ur-ouu's trade).

3. Buy unnecessary securities.

4. Invest in a business friendly.

5. Engage in pair-trading.

6. Purchase junior liens.

7. Acquire foreign real estate.

8. Invest in uncommonly priced (i.e., real co-
tate bail for a rise in value).

9. Lend money on personal notes without/for

10. Invest in working assets."

A careful study of the Iranian Policies Vs. Long Tenition and the list of "duties" of two charts a remote the kind of securities available for a trader operating under the Iranian-Ben Sinna

It should be noted that the Iran Post or Long Lair Bryn, does not allow Iranians to invest in equities of companies which the Iranian has kept their private structure in invest to decent stocks. This accentuates the main difference between the two rules. One is right while the other is wrong and not cope with the changing conditions. Our

(1) Giordano, G., "The Assassination of", Tempio del Sangue, p. 167, 1942

APPENDIX B Cont'd

a period of years Massachusetts trustees have invested in certain qualified common stocks. A stock may be eliminated from the investment portfolio if prospects of that company are not promising or a stock may be added if it appears that it merits a trust investment status.

The Massachusetts Rule has worked out so well over the past hundred years that a number of states have enacted model statutes embodying almost word for word the language used by Justice Putnam in Harvard College v. Amory. (1)

(1) Shattuck, H., Speech on "The Massachusetts Prudent Man in Trust Investments", Given at meeting of the Real Property, Probate and Trust Law Section of the American Bar Association in Cincinnati, Ohio, December 18, 1945. Reprinted in the Boston University Law Review, Vol. XXV, 1945.

APPENDIX B (cont'd)

a period of years Gesellschaftsrechte therefor have increased in certain positions and decreased in others. A stock may be distributed from the investment portfolio if proceeds of such exchange are not presently or a short day be added if it appears that it merits a fixed investment status.

The Gesellschaftsrechte Rule has worked out as well over the last hundred years than a number of others have accepted model statutes and bodying almost word for word the language used by Justice Brewer in Harvard College v. Amory. (1)

(1) Stevens, G., Speech, "The Gesellschaftsrechte Trustee Can in Trust Investments", Given at meeting of the Bar Association, Florida and Trust Law Section of the Bar Association for Gainesville, Florida, Dec. 13, 1960. Reprinted in the Boston University Law Review, Vol. XXV, 1960.

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*Cities Service Company
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*Humble Oil and Refining Company
*Imperial Oil Company, Ltd.
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